

FINDINGS AND RECOMMENDATIONS
A REPORT OF THE WATER RESOURCES CONSERVATION ADVISORY COUNCIL
NOVEMBER 2009
A REQUIREMENT OF PUBLIC ACT 189 OF 2008

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GLOSSARY OF TERMS

“*ARI*” means Adverse Resource Impact.

“*ATD*” means the water Accounting and Transaction Database managed by *DEQ*.

“*Compact Council*” means the Great Lakes-St. Lawrence River Basin Water Resources *Council*.

“*Compact*” means the Great Lakes-St. Lawrence River Basin Water Resources *Compact*.

“*Council*” means Water Resources Conservation Advisory *Council* as created under Public Act 189 of 2009.

“*DEQ*” means the Michigan Department of Environmental Quality.

“*DNR*” means the Michigan Department of Natural Resources.

“*NRC*” means the Natural Resources Commission.

“*NREPA*” means the Natural Resources and Environmental Protection Act.

“*Plan*” means a Preventative Measure Implementation *Plan*.

“*Preventative Measures*” means an action affecting a stream or river that prevents an adverse resource impact by diminishing the effect of a withdrawal on stream or river flow or the temperature regime of the stream or river.

“*Process*” means the Water Withdrawal Assessment *Process*.

“*Regional Body*” means the Great Lakes – St. Lawrence River Basin Water Resources *Regional Body*.

“*Screening Tool*” means the internet based Water Withdrawal Assessment Tool.

EXECUTIVE SUMMARY AND RECOMMENDATIONS

Public Act 189 of 2008 created the Water Resources Conservation Advisory *Council* (*Council*) and charged this *Council* with the following tasks:

- a) Evaluate the new Water Withdrawal Assessment Tool (*Screening Tool*) and make recommendations for refinement.
- b) Study and make recommendations on an adverse resource impact (*ARI*) standard for the Great Lakes, inland lakes, and other aquatic systems due to large quantity withdrawals.
- c) Make recommendations to reconcile conflicting state laws related to water use.
- d) Make recommendations on the development of a state water conservation and efficiency program.
- e) Develop a framework for evaluating measures to prevent *ARIs*.
- f) Make recommendations regarding water use and availability educational materials.

Respective of these tasks, the *Council* offers the following findings and recommendations. ***Council recommendations offered in this report do not call for change to the enabling statutes, but additional resources are required to achieve program purposes.***

EVALUATION OF THE WATER WITHDRAWAL ASSESSMENT TOOL

FINDING: After thorough review of all components, the Water Withdrawal Assessment Process (*Process*) will require continued maintenance and improvement.

RECOMMENDATION: Applicable state department staff should correct technical errors, make minor technical revisions and technical changes to the *Screening Tool* in accordance with the methodology adopted by the Natural Resources Commission (*NRC*) with annual reporting to the *Council*. Revision to *process* methodologies related to temperature, hydrology, and stream or river flow will be reviewed by the *Council* and presented to *NRC* for review and decision. Any proposed modification of legislative *process* or definitions will be reviewed by the *Council* for recommendation to department leadership and the legislature for action.

RECOMMENDATION: The *Council* should establish a Water Management Science Advisory Committee within the *Council* to assure adoption of an adaptive science program to underpin the continually developing Michigan water management *process* including continued “refinement of the *Screening Tool*.”

RECOMMENDATION CARRIED FORWARD FROM THE APRIL 2009 COUNCIL REPORT: All aspects of the *Process* should be moved from the 1:100,000 to the 1:24,000 map scale when feasible to best align the scale of the statewide *Screening Tool* with the on-the-ground scale of policy decisions. Future decisions regarding scale and structure of the base map should be sensitive to efforts of regional partners

to construct a consistent Great Lakes basin-wide mapping platform for water management.

FINDING: Inability to update and enhance base water data undermines the long-term effectiveness of the *Process*.

RECOMMENDATION (RESTATED FROM PRIOR REPORTS): As stated in the 2007 *Council* report, any implementation must include a *plan* for ongoing, periodic field testing and review and revision of the *process* and associated tools and databases. *DEQ* should continue to gather data and to update and enhance hydrologic and water use data and data management the water accounting database and the *Screening Tool* to assure accuracy in the *Process*.

FINDING: Changes made to the *Process* that account for withdrawals from cold water segments upstream of cold-transitional river segments are scientifically valid and appropriate. When withdrawals are from warm or cool water segments upstream of cold-transitional river segments, the *Council* finds that potential impacts are buffered by the safety factor and hydrologic and thermal characteristics, and no changes in the screening *process* are warranted at this time. However, the *Council* recognizes there is more to learn and has clearly flagged this issue for future study and refinement.

ADVERSE IMPACTS ON INLAND LAKES AND OTHER AQUATIC RESOURCES

FINDING: The *Council* could not adequately address modification of the current definition of *ARI* to cover the Great Lakes or associated coastal wetlands within the time period provided.

FINDING: Reviewing the potential impacts of large capacity withdrawals on inland lakes and wetlands is a time appropriate focus that offers the greatest opportunity for significant progress toward refining decision-making tools.

FINDING: It is likely that reducing groundwater inputs to groundwater dependent lakes and wetlands has the potential to cause significant changes to ecosystems. However, at this time it not possible to develop a general model that describes the “significance” of ecological impacts resulting from water withdrawals.

FINDING: Fish populations are not an appropriate indicator for assessing *ARIs* for lakes or wetlands. Published studies suggest wetland vegetation as a metric for evaluating the effects of water withdrawal on wetland function. For evaluating the effects of water withdrawal on lake function, published studies suggest littoral zone vegetation and water chemistry as metrics. Unfortunately, there is not sufficient information in the published literature to make a definitive policy recommendation as to the exact metrics that should be used to define *ARIs* in lakes and wetlands. However, these metrics appear to be a good starting point for metric development in Michigan’s lakes and

wetlands.

FINDING: Using existing research and geospatial information, it should be possible with further study to develop a lake classification system for Michigan based on measures of groundwater contribution. Unfortunately, it was not possible to develop such a classification system for lakes in the timeline provided.

FINDING: It is technically feasible to develop quantitative models that generally describe the ecological response of lakes or wetlands to water withdrawals, but only after additional targeted scientific research and sufficient analytical time and attention.

RECOMMENDATION: A quantitative model describing the response curves of lakes and wetlands to water withdrawals should be developed as a result of a carefully designed rigorous field-based scientific study. If validated, the resultant model could be used in the legislative *process* (analogous to the current stream-based *Process*) to identify sensitive lakes and wetlands that are not adequately protected by the current stream-based *process*.

REVIEW OF WATER LAW CONFLICTS

FINDING: As no clear conflicts in state law related to the use of the waters of the state are apparent, the *Council* does not recommend any action by the Legislature to address conflicts in state water law.

MICHIGAN WATER CONSERVATION MEASURES

FINDING: Creation of a Michigan Water Conservation and Efficiency Initiative consistent with regional goals and objectives adopted by the *Regional Body* is necessary for Michigan compliance to the *Compact*.

RECOMMENDATION: The *Council* should release Attachment B of this report titled “Michigan Water Conservation and Efficiency Initiative” for public review and comment. After public review, evaluation and appropriate modification, the *Council* should recommend adoption of the report as fulfillment of Michigan’s respective responsibilities under the *Compact* regarding water conservation.

RECOMMENDATION: Michigan should suggest to the *Compact Council* the development of a conference for states to share information regarding state specific water conservation programs where stakeholders can be involved.

RECOMMENDATION: The *Council* should continue work on water conservation for the purpose of developing a greater inventory of current conservation measures employed by business and opportunities for developing market based incentives for water conservation.

PREVENTATIVE MEASURES AND ADVERSE RESOURCE IMPACTS

FINDING: Consideration of a preventative measure is embedded in the permit *process*. It is unlawful to develop a new large-quantity water withdrawal if it will create an adverse resource impact. As such, proceeding with a withdrawal predicted to cause one, but contingent upon a successful preventative measure implementation is embedded in the water withdrawal permit application *process*. *DEQ* will ensure that a legally enforceable implementation schedule for the preventative measure is part of the permit conditions. If an approval of a water withdrawal permit that includes consideration of *preventative measures* is dependent on an arrangement between the applicant and a third party, *DEQ* will also ensure that the permit is contingent on the appropriate legal contracts between applicant and third parties.

FINDING: *DEQ* will need the following additional, specific information to evaluate a proposed preventative measure:

- a. Theoretical basis of how the proposed activity will prevent an *ARI*.
- b. Results of prior use of a like preventative measure, if available.
- c. *Comparison* of baseline conditions with the measured or anticipated effect of the proposed preventative measure.
- d. Expected, measurable results of a successful preventative measure.
- e. A description of conditions under which the proposed withdrawal may begin.
- f. A data monitoring *plan* to document project success.
- g. A contingency *plan* describing actions to be taken if monitoring results are not consistent with the project overall effect of the preventative measure and withdrawal.

FINDING: Targeted *planning* and data collection **IS NECESSARY** to support a permit application containing a proposed preventative measure. Designing and supporting a decision on a proposed preventative measure will take time and be expensive. Data collection, careful project design and early engagement in the permitting *process* by both *DEQ* and the applicant is important to support a regulatory decision.

Recommendation: The *DEQ* should develop a *process* to assist a person in preparing a proposed preventative measure permit application. The *DEQ* should provide the following information and assistance:

- a. Information on an applicant's options site specific review concluding that a proposed withdrawal would cause an adverse resource impact and information on the applicant's options.
- b. Opportunities to meet with the applicant to discuss the potential for developing a successful preventative measure permit application.
- c. Review and comment on a specific *plan* to collect and develop the necessary information for a proposed preventative measure permit application.

Recommendation: The Department should develop a *process* to protect a person considering a proposed preventative measure permit application from later potential water users. It will take time and funds to develop a proposed preventative measure permit application. The person considering doing so should be able to “reserve” any available flow—and flow that might be made available through a potential preventative measure—much like a person can reserve flow for 18 months simply by filing a registration.

Recommendation: The *council* should continue to evaluate and consider issues associated with the concept of *preventative measures* with a commitment to further addressing this issue within the final report of the *Council as required not later than July 9, 2011*. Topics needing further attention include, but are not limited to:

- Reservation of water volumes in the accounting for “*preventative measures*” proposals not associated with a current application to withdraw.
- Appropriate tracking and accounting in water use database for the successful execution of a preventative measure.
- Development of more specific *preventative measures* application templates to improve efficiency of review *process*.
- Review of sufficient application fees to evaluate complex *preventative measures* applications.
- Use of the Water Management Science Advisory Committee for the evaluation of complex *preventative measures* applications.
- Addressing the retirement of existing water uses in the *preventative measures* context.

EDUCATION NEEDS OF MICHIGAN’S WATER WITHDRAWAL PROGRAM

FINDING: The *Council* chose to focus on the information needs of Water User Committees and the Water Resource Assessment and Education Committees in order to facilitate their formation and optimize their effectiveness at their respective roles in the *process*.

FINDING: While there is an abundant supply of existing education information and technical resources regarding the *Process* and water management in general, gaps exist.

RECOMMENDATION: Water User Committees and Water Resources Assessment and Education Committees should proactively meet, communicate, and *plan* for managing local water resources, and therefore avoid the occurrence of an *ARI*.

RECOMMENDATION: The *Council* should construct a “*Process and Timeline Guidebook*” for committees called for in Michigan water law. This could be written by academics, but it should be provided by the state and made available when these committees are formed.

RECOMMENDATION: The *Council* should construct an annotated list of materials provided in this report to be made available on the *DEQ* and *DNR* websites in addition to being included in the “*Process and Timeline Guidebook*” which would also be available online. This list will be updated as new materials become available.

RECOMMENDATION: Water committees should look to *DEQ* and university resources to help meet educational needs. The *Council* acknowledges that committee members themselves may have their own technical data, such as hydrological and ecological monitoring data, that can be considered.

COUNCIL CHARGE

On July 9, 2009, Governor Granholm signed into law Public Act 189 of 2008 creating the *Council* within *DNR*. Cooperatively appointed by the Governor, Senate Majority Leader, Speaker of the House of Representatives, and *DEQ* Director in August 2009, the 21 member *Council* has worked diligently to complete the following tasks required by PA 189:

- a) When the department makes the *Screening Tool* available for testing and evaluation, conduct testing and evaluate the operation and the accuracy of the *Screening Tool*, including implications an evaluation period.
- b) Study and make recommendations regarding the development and refinement of the *Screening Tool*.
- c) Study and make recommendations on whether and how the definition of an *ARI* should be modified to more specifically address potential impacts to the Great Lakes, inland lakes, and other aquatic systems due to large quantity withdrawals.
- d) Make recommendations on reconciling conflicts in state laws related to the use of the waters of the state.
- e) Make recommendations on the development and implementation of the state's water conservation and efficiency program under section 4.2 of the *Compact*.
- f) Develop a framework for evaluating *preventative measures* designed to prevent *ARIs*.
- g) In consultation with academic institutions and other nonprofit organizations, make recommendations regarding educational materials related to the use and availability of water resources.

As a means of tracking progress and evaluation, the law requires the *Council* to submit the following reports, approved by a majority of the voting members of the *Council*, to the Senate majority leader, the speaker of the House of Representatives, and the standing committees of the legislature with jurisdiction primarily related to natural resources and the environment and to *DEQ*:

- 1) Not later [January 8, 2009], study and make recommendations on how the *screening tool* could be updated to reconcile differences between baseline capacity and actual withdrawal amounts to assure the accuracy of the *Screening Tool's* determinations.
- 2) Not later than February 8, 2009, a progress report of the *Council* findings and recommendations for items b-g as listed above.
- 3) Not later [April 8, 2009], submit a report that contains the results of its testing and evaluation and any recommendations that the *Council* has to improve the operation of the *Screening Tool*.
- 4) Not later than August 8, 2009, a final report of the *Council* findings and recommendations for items b-g as listed above.
- 5) Not earlier than [July 9, 2011], submit a report that makes recommendations regarding how the *Process* could be improved in order to more accurately assess adverse resource impacts. The report shall contain specific

recommendations on the use of the assessment tool, the site-specific review *process*, the permitting, and any other measure that the *Council* determines would improve the *Process*.

The *Council* completed items 1 – 3 above by the dates assigned. The reports are available on the *Council* website at www.michigan.gov/dnr/wrcac . This report represents the *Council*'s final findings and recommendations related to item 4. Due to the depth of this task, the *Council* sought and was granted a three month extension for report submission by the respective chairs of the standing committees of the legislature with jurisdiction primarily related to natural resources and the environment. As a result, this report will be submitted not later than November 8, 2009.

To accomplish required tasks, the *Council* utilized the following sub-committees.

- a) **Evaluation Sub-Committee:** tasked with further development, functional review and proposed refinement of the *Screening Tool*.
- b) **Inland Lakes Sub-Committee:** tasked with reviewing the definition of *ARI* as applied to the Great Lakes, inland lakes, and other aquatic systems due to large quantity withdrawals.
- c) **Law Conflict Sub-Committee:** tasked with offering recommendations on reconciling conflicts in state laws related to the use of the waters of the state.
- d) **Conservation Sub-Committee:** tasked with offering recommendations on the development and implementation of the state's water conservation and efficiency program under section 4.2 of the *Compact*.
- e) **Preventative Measures Sub-Committee:** tasked with develop a framework for evaluating *preventative measures* designed to prevent *ARIs*.
- f) **Education Sub-Committee:** tasked with offering recommendations regarding educational materials related to the use and availability of water resources.

Sub-committee membership was not limited to the *Council* and the *Council* appointed technical advisory committee, but also included interested members of the public. Sub-committees reported progress to the *Council* monthly. This report represents the collective efforts of the *Council* to meet the requirements of law.

EVALUATION OF THE WATER WITHDRAWAL ASSESSMENT TOOL [**SCREENING TOOL**]

The 2008 legislation charged the *Council* to "study and make recommendations regarding the *development and refinement* of the *Screening Tool*." Items I-II below address this charge while items III-V provide some follow-up to the April 9, 2009 report:

- I. A *process* for continued adaptive refinement of the *Process* and *screening tool*.
- II. A *process* to guide continued adaptive science to underpin the *Process* and *Screening Tool*.
- III. An Update on *DEQ* Water Accounting Database.
- IV. An Update on Downriver Accounting relative to upriver warm or cool segments.
- V. Recommendations carried forward from April report.

I. A *PROCESS* FOR CONTINUED ADAPTIVE REFINEMENT OF THE *PROCESS* AND *SCREENING TOOL*

Initially, the Groundwater Conservation Advisory *Council* adopted state-of-the-art concepts and technologies in building the initial version of the Water Withdrawal Assessment *Process* (*Process*) and Internet based Water Withdrawal Assessment Tool (*Screening Tool*). As these tools are used more, needed improvements will be identified and new scientific concepts may need to be integrated; materially increasing the tool's usefulness. The need for adaptive, iterative science to underpin progressive water management is clearly stated in both the Great Lakes - St. Lawrence River Basin Water Resources *Compact* (*Compact*) and the recent Michigan water management legislation (2008 PA 179 – 189).

After thorough review of all components of the *Process*, including the *Screening Tool*, the following table provides:

- An outline of the types of technical changes that are anticipated.
- Appropriate decision-making (authority) levels.
- The appropriate review and approval *process* for each identified change.

This table is provided as a general guide to the *processes* and authorities; not as a rigid structure without flexibility.

Type of Change	Review and Approval <i>Process</i>	Decision Maker
1. Correct technical errors or make minor technical revisions. Examples: Watershed boundary, minor calculation error, correction to withdrawal registration, improved index	<i>DEQ</i> & <i>DNR</i> technical staff to make changes as appropriate. Each change will be documented and an annual compilation will be made available online. <i>DEQ</i> program staff will check on effects to any registered users and notify these accordingly. An annual update will be provided to the <i>Council</i> .	[Level 1] <i>DNR</i> & <i>DEQ</i> technical staff.

flow estimate resulting from site-specific review, or changes to the web user interface.	<i>DEQ</i> will develop internal procedure for accepting and verifying additional flow measurements. <i>DEQ</i> staff may revise specific segment estimates of Index Flow in the Accounting Database, based on site-specific review.	
2. Technical modifications Adjustments related to considerations of temperature, hydrology, and stream or river flow based on methodology adopted by order of the <i>NRC</i> .	<i>DEQ</i> & <i>DNR</i> technical staff to make changes as appropriate. Each change will be documented with annual compilation available online. <i>DEQ</i> program staff will check on effects to any registered users and follow up as appropriate. An annual update will be provided to the <i>Council</i> .	[Level 1] <i>DEQ</i> & <i>DNR</i> technical staff
3. River segments Revise the ecological type or boundaries for a river segment.	Recommended revisions developed by <i>DEQ</i> & <i>DNR</i> technical staff will be presented to the <i>Council</i> for review with <i>Council</i> submission to <i>NRC</i> for review and decision. Each approved change will be documented and made available annually online. <i>DEQ</i> program staff will determine effects to any registered users and follow up as appropriate. An annual update will be provided to the <i>Council</i> .	[Level 2] <i>NRC</i> .
4. Methodologies Revise methodologies related to considerations of temperature, hydrology, and stream or river flow.	Recommended revisions developed by <i>DEQ</i> & <i>DNR</i> staff for review by <i>Council</i> . This should occur not less than every 5 years. Recommendations from the <i>Council</i> are presented to the <i>NRC</i> for review and decision.	[Level 2] <i>NRC</i> .
5. Modify or add statutory definitions or process. Example: Revise the characteristic and thriving fish curves based on updated analyses.	Recommendations developed by agencies technical staff for Review by <i>Council</i> . Recommendations presented by <i>Council</i> to the <i>DEQ/DNR</i> directors and legislative leadership to pursue legislative changes.	[Level 3] State legislature .

II. PROCESS TO GUIDE CONTINUED ADAPTIVE SCIENCE TO UNDERPIN CONTINUED REFINEMENT OF THE *PROCESS AND SCREENING TOOL*

To assure adoption of an adaptive science program to underpin emerging water management including continued “refinement of the *Screening Tool*”, the *Council* will

establish a Water Management Science Advisory Committee as a formal unit of the *Council*. The purpose of this committee is to act as a “collaboratory” of scientific expertise from a broad range of societal water interests. Committee membership would include scientists representing state and federal agencies, universities, and a range of private-sector water interests. Membership may or may not include members of the current *Council*. Functions of this committee include, but are not limited to:

- Involvement in all steps of the science oversight *process* including building a broad-based, societal understanding of existing knowledge, incorporation of new findings, and exploration of key questions regarding water resources.
- Collaboration with other science-based Great Lakes water management efforts. The committee will work closely with regional scientists and scientific groups, helping foster the regional science community suggested by the *compact*. The committee will also track and participate in national and international efforts such as the *Environmental Flows Program of The Nature Conservancy and the U.S. Geological Survey* and the *Instream Flow Council*. It is imperative that Michigan efforts be tightly aligned with leading thinking on water management science.
- Development and management of a water management science agenda, structured according to priorities identified as best supporting and improving Michigan’s *Process*, including the *Screening Tool*. A published agenda will strategically guide research development efforts by all parties.
- Work to secure external funding and grant support to address the priority needs as identified in the water management science agenda.

The committee will meet annually (at a minimum) to review the water science agenda, review the state of water management science and provide annual reports to the *Council*. The committee may convene periodic scientific symposia and workshops to draw together state, regional, and national experts to focus on priority science needs.

III. UPDATE ON *DEQ* WATER ACCOUNTING DATABASE

The Accounting and Transaction Database (*ATD*) captures and stores the change(s) in available water occurring from real-time registered withdrawals through the *Screening Tool*. These changes are handled by two tables; the accounting table and the transaction table. The accounting table is a mirror image of the watershed layer in the *Screening Tool*. It contains a static set of fields for the original available water in each watershed (A, B, C cutoffs) and a dynamic adjusted set of A, B, C, cutoffs. When a withdrawal is registered, the appropriate amount of water is instantly subtracted from each of the affected watersheds in the dynamic set of fields. When a different user wants to withdraw from the same watershed, the *Screening Tool* will look up the newly adjusted available water from the accounting table and display the results in real-time.

The transaction table keeps a running log of all activities performed on the accounting table. It provides a series of fields with transaction codes that are used to track events. For example, if someone registers a withdrawal, the code "Reg" is placed in the transaction table indicating a registration, or "SSR" for a site-specific review. Automatic time stamps accurately log each event. A variety of other fields provide further detail on events. Transactions are automatically cross-linked to registration numbers when registered through the *Screening Tool*.

The *ATD* records events through automatic transactions received from the *Screening Tool* and manual transactions administered by *DEQ*, providing a detailed history of everything that happens within a watershed. The automatic transactions are triggered by electronic submission of a registration or site-specific review. Stream depletions are calculated by the *Screening Tool* for affected watersheds and stored in the accounting table with every detail about the withdrawal (i.e. time/date, water removal, pumping parameters, etc.) stored in the transaction table.

The manual transactions allow *DEQ* to adjust available water within the watersheds. For example, a site-specific review is requested for a large capacity withdrawal and water is taken away from the watershed by automatic transaction. If *DEQ* finds through their site-specific review that more water is actually available at this location, the appropriate amount of water can be manually added to the watershed. In addition, withdrawals registered before February 2009 were accounted for in adjusted watershed *ARI* zones as required described by the legislation. These types of adjustments can be made manually through the accounting database, with each change recorded in the transactions table. When making changes, *DEQ* can select from a variety of transaction categories and subcategories such as site-specific reviews, permitting, registrations, verifications, etc. These transaction types come with a standardized coding, allowing the database to be quickly searched or queried for certain transaction types.

The tables within the *ATD* are cross-linked; allowing administrators to select a watershed and view all transactions that have occurred in that watershed, or view a registration associated with a particular transaction. In addition, the database administrators can select a watershed identification number and open a map showing the location of that watershed in the state. They can also select a registration to view the pin-point location of that withdrawal on a map. Other cross-linked features include a "Wellogic" identification number that can be linked in the future to well drilling records.

In order to navigate and retrieve information quickly from the database, some pre-built queries have been programmed in the *ATD*. One such query allows administrators to view watersheds that have recorded changes in available water. In the transaction table, three additional queries are being developed to display transactions that occurred automatically through the *Screening Tool* and those that were generated manually by *DEQ*. The third query would allow managers to view site-specific reviews that have lapsed their 10 day time period.

A new function has been developed to assist users in changing some parameters from their original registration. The user can modify their original registration by re-running the *Screening Tool* with new information (i.e. location, depth, capacity, etc.) and the accounting database will flag the old registration as obsolete and add the new registration in its place. The accounting database will automatically add the original withdrawal effects back to the affected watersheds and then remove the new amounts for the updated registration.

The *ATD* is functioning effectively. It provides *Screening Tool* users with up to date information on water availability while providing DEQ program managers access to information about registered water use in water management areas. This said, maintaining an accurate water management database is paramount to the long-term effectiveness of the *Process*. As stated in the 2007 *Council* report, any implementation must include a *plan* for ongoing, periodic field testing and review and revision of the *process* and associated tools and databases. The *Council* recommends that *DEQ* continue to gather data and update hydrologic to enhance the *DEQ ATD* and the *Screening Tool* to assure accuracy in the *Process*.

IV. UPDATE ON DOWNRIVER ACCOUNTING RELATIVE TO UPRIVER WARM OR COOL SEGMENTS.

In the *Council's* April 9, 2009 report, a potential problem was identified with the *Screening Tool* where a downriver *ARI* to a Cold-Transitional segment could be caused by cumulative upriver withdrawals. For rivers where upriver Cold segments are critical to maintaining the colder temperatures in these temperature sensitive, downriver segments, the *Council* recommended that downriver accounting be implemented, wherein the screening function is extended to consider the downriver Cold-Transitional segment. The *Council* implemented this recommendation.

After implementation, the *Council* further considered whether a similar downriver screening extension would be appropriate for situations where the segments upriver of the Cold-Transitional segment are Cool or Warm. The *Council* finds that the potential impacts to downriver cold-transitional river segments from withdrawals from warm or cool water upstream segments are buffered by a safety factor in the screening tool, and by hydrologic and thermal characteristics. The likelihood of warming thermal impacts in these situations is very small or could even be beneficial (since a proposed withdrawal would be removing "warm" water upriver and would not affect local inputs of cooling groundwater to the downriver segment).

The *Council* recommends that downriver impacts in these situations should not be considered in making upriver screening decisions. However, we recognize that our knowledge of the overall hydrologic and hydraulic impacts of the upriver withdrawals in these situations is limited (as the *Screening tool* is focused more on thermal impacts). We therefore urge that this issue, and a related issue concerning instances where there is an impoundment or lake between an upriver Cold segment and the potentially impacted Cold-Transitional segment, be clearly flagged for future study and refinement.

V. RECOMMENDATIONS CARRIED FORWARD FROM THE APRIL 2009 REPORT

To best align the scale of the statewide *Screening Tool* with the on-the-ground scale of policy decisions, we recommend that (when this becomes feasible) all aspects of the *Process* be moved from the 1:100,000 to the 1:24,000 map scale. Future decisions regarding scale and structure of the base map (i.e., geographic database) should also be sensitive to efforts among regional partners to construct a consistent Great Lakes basin-wide mapping platform for water management.

ADVERSE IMPACTS ON INLAND LAKES AND OTHER AQUATIC RESOURCES

The *Council* investigated the *Process* and its provision of adequate hydrologic protection for Michigan's other freshwater ecosystems or whether some additional, more focused assessment *processes* are needed. Specifically, the *Council* was charged with "*studying and making recommendations on whether and how the definition of ARIs should be modified to more specifically address potential impacts to the Great Lakes, inland lakes, and other aquatic ecosystems due to large quantity withdrawals.*"

The current *Process* subdivides the state into 5600 'water management areas' or the drainage areas of each stream segment. An estimated summer dry-period water budget assigned to each water management area. The goal of the law is to prevent *ARIs* to the freshwater ecosystems within each of these water management areas as resulting from a large capacity water withdrawal. The *Process* accounts for the reductions to the water budgets for the streams or rivers that drain out of each water management area. The *Process* then uses stream flow and stream fish assemblages to assess an *ARI* from individual and cumulative withdrawals of water. In assessing the effect of stream flow reductions, the *Process* also indirectly manages the overall flow in the entire watershed water budget. Consequently, it is assumed that this assessment framework also provides some measure of protection to the overall hydrologic regime of the other aquatic ecosystems (e.g., inland lakes and wetlands) that lie within the water management area. The purpose of this section is to examine this assumption.

Due to the immense nature of the above charge, the *Council* determined it could not adequately address possible modification of the current definition of *ARIs* to cover the Great Lakes or the Great Lakes coastal wetlands within the time period provided. The current *Process* is designed for much smaller aquatic systems (watershed areas of stream segments) and is not readily adaptable to an aquatic system the size of a Great Lake or its associated wetlands. Given the scale of the Great Lakes, the relatively short time frame, and the limited resources of the *Council*, the *Council* would not have been able to provide any meaningful analysis or recommendations. Other organizations, such as the International Joint Commission, are currently evaluating the impacts of changing water levels on the Great Lakes. It is recommended that the question of evaluating the definition of and adverse resource impacts to the Great Lakes be revisited after these studies have been completed and after final rule development on the Section 316(b) standards have been finalized within the EPA.

Instead, the *Council* focused on impacts from water withdrawals on inland wetlands (which were defined as the 'other aquatic ecosystems') and inland lakes (hereafter referred to as 'lakes and wetlands'). Inland lakes and wetlands are of the same approximate scale as watershed management areas, are contained within those areas and provide a more manageable and efficient opportunity for building on the work done to develop the current *Screening Tool* for streams and rivers. It was the decision of the sub-committee, and consequently the *Council*, to focus on inland lakes and wetlands in an effort to make significant progress toward refining decision-making tools for

reviewing the potential impacts of large capacity withdrawals on a broader array of water resources.

Current state law prohibits any large quantity withdrawal from causing an *ARI*. The legislature has provided an objective standard for what constitutes an *ARI* in streams (percentage of index flow by stream type). For a lake or pond (of more than 5 acres), the legislature has defined an *ARI* through use of a narrative standard: “*Decreasing the level of [the] lake or pond... through a direct withdrawal in a manner that would impair or destroy the lake or pond or the uses made of the lake or pond, including the ability of the lake or pond to support characteristic fish populations, or such that the ability of the lake or pond to support characteristic fish populations is functionally impaired.*” The legislature has not further defined what constitutes an *ARI* for a wetland.

The goal of the *Council* was to develop a better scientific understanding of how lakes and wetlands respond to large capacity water withdrawals and of the level of response that would constitute an *ARI*. That is, once the science is able to model the environmental response for lakes and wetlands to withdrawals, a clear standard could be developed for an *ARI* for lakes and wetlands. The scientific underpinnings of the standard might then be used to develop a *Screening Tool* for lakes and wetlands similar to that used for streams.

Approach & Findings

To address the *Council* charge, the following questions were posed, respective approaches to answers were defined and associated findings are presented. Withdrawals from both surface water and groundwater have the potential to adversely impact wetlands and lakes. They are both considered in this section whenever possible. However, each type of withdrawal can have different effects on lakes or wetlands. For example, direct surface water withdrawal will affect all lakes or wetlands through direct decreases in water volume, and ultimately, some decrease in water level depending on changes in water volume. However, groundwater withdrawals will affect different lakes or wetlands differently, in part because lakes or wetlands in Michigan receive different relative amounts of groundwater. Thus, in this section, we focus more heavily on establishing the importance of groundwater for lakes and wetlands.

I. HOW MIGHT WATER WITHDRAWALS ALTER LAKES AND WETLANDS?

Approach: Examine and summarize the evidence from the scientific literature on the importance of groundwater to lake and wetland ecosystem functions.

Findings – Lakes: Groundwater inputs to lakes support important physical, chemical and biological functions, and the reduction of groundwater inputs at some level could potentially alter many of these lake functions. First, if a lake receives a very large proportion of its water from groundwater and these groundwater inputs decline, then lake levels will decline. There have been many recent studies showing that lake physical, chemical and biological function is

altered to varying degrees as lake water levels decline. However, we also want to highlight the importance of the direct input of the groundwater itself, which we summarize next.

For physical effects in lakes, high groundwater inflow in a lake has the potential to decrease water temperature (i.e., it is colder than surface water during the growing season), to lead to less fine sediment accumulation and to increase overall lake water color (i.e., high water color can absorb UV radiation, which is beneficial to aquatic organisms). Groundwater has also been well recognized to strongly influence water chemistry in lakes. High groundwater inputs generally lead to high concentrations of dissolved ions, especially those that buffer lakes from the effects of acid rain. Some biotic organisms rely on groundwater inputs for survival such as organisms containing shells that need calcium or microscopic *plants* that require silica in large quantities for growth. Finally, groundwater has more recently been examined for its effects on lake organisms. In addition to the influences as outlined above, different types of biota have been found to respond more directly to groundwater in a *variety* of studies. Some studies show that rooted aquatic *plants* respond positively to groundwater inputs because of inputs of some ions and nutrients that the *plants* require. Different *plant* communities dominate depending on the depth to the groundwater table in the shorelines of some lakes. Other studies show that certain fish species, particularly trout, need groundwater areas for spawning, and several have argued that groundwater is beneficial for fish eggs because it may have more favorable temperature for egg development, more favorable chemical composition and decreased fine sediment accumulation.

Finding- Wetlands: Groundwater inputs to wetlands support important physical, chemical and biological functions. Reduction of groundwater inputs at some level could potentially alter many of these wetland functions. First, as for lakes, if a wetland receives a very large proportion of its water from groundwater, and groundwater inputs decline, then wetland levels will decline. Studies have shown that wetland physical, chemical and biological function is altered to varying degrees as wetland water levels decline. In particular, there is a very strong relationship between wetland water levels and supported vegetation type. However, we also want to highlight the importance of the direct input of the groundwater itself which we summarize next.

For the physical and chemical effects in wetlands, it is assumed many of the *processes* that have been found to operate in lakes would also operate in wetlands (i.e., to some degree one can view wetlands as very shallow lakes), although there have been fewer studies examining these effects in wetlands. In one study, groundwater inputs were shown to influence such factors as wetland organic matter content and dissolved ions. A particularly interesting example is a study that found that groundwater inflow may be responsible for the exceptionally high species diversity observed in rich fens by increasing nutrient availability in these nutrient-limited wetlands. *Plants* in general, have been found to be very

tightly linked to the overall hydrology of wetlands in which different forms of vegetation (emergent, wet meadow, shrub, and woody) persist depending on water depth and inundation period. In addition, compared to lakes, there have been more studies conducted in wetlands that have actually examined what happens as a result of groundwater extraction. Such studies have shown effects such as the wetlands drying out to varying degrees, transitions among different vegetation types, reduced species richness, and transitions to drought-tolerant species.

Summary Finding: It is highly likely that reductions in groundwater inputs to lakes and wetlands that normally receive groundwater inputs have the potential to result in ecologically significant changes to these ecosystems. However, at this time, it not possible to develop a general model that describes the ecological impacts that would result from a given level of ground or surface water withdrawal across a range of wetland or lake types or to generally describe when those impacts would be deemed “significant” (i.e., to define an *ARI*). *ARI* determination for these aquatic resources may be determined on a site-specific basis in accordance with existing law.

II. WHAT ARE THE BEST METRICS OR INDICATORS OF POSSIBLE ALTERATIONS THAT COULD BE USED TO DEVELOP A STANDARD TO DEFINE *ARI* FOR LAKES AND WETLANDS?

Approach: Identify possible chemical and/or biological indicators that can be used to assess the impact from water withdrawal on lakes and wetlands, and how these indicators can be used to measure potential *ARIs*. The *Council* explored evidence from the published scientific literature as well as existing scientific data from Michigan lakes and wetlands where available.

Finding - The use of fish populations: Fish populations in lakes or wetlands are not a good indicator to use for assessing *ARIs* for lakes or wetlands. Fish are not present in all wetlands and even where they are, they may not be present at all times. Fish are not a good indicator for lakes (and wetlands that contain fish), because there are few if any clear relationships between groundwater inputs to lakes and fish communities with which to base a general model of *ARIs*. In other words, fish communities in lakes and wetlands do not respond as clearly to differences in water withdrawals as they do in streams.

Finding - Identification of other possible metrics: For wetlands, published studies suggest the use of one general class of metrics for evaluating the effects of water withdrawal on wetland function: wetland vegetation. Specifically such metrics might include total vegetation area of *plants* of different functional types, species richness, or shifts in species composition. For lakes, published studies suggest the use of two general classes of metrics for evaluating the effects of water withdrawal on lake function: littoral zone vegetation and water chemistry. Specifically, for littoral zone vegetation such metrics might include total vegetation area of *plants* of different functional types, species richness, or shifts

in species composition. For water chemistry, such metrics might include alkalinity, silica concentration, or calcium concentration. Unfortunately, for both lakes and wetlands, there is not sufficient information in the published literature to make a definitive policy recommendation as to the exact metrics that should be used to define *AR*'s in lakes and wetlands in Michigan. However, the above classes of metrics appear to be a good starting point for metric development in Michigan's lakes and wetlands.

Finding - The importance of the above classes of metrics: The above classes of metrics are important features of lakes and wetlands that serve critical functions that define these ecosystems and the ecosystem services that they provide to people. Vegetation in wetlands is a critical biological and physical feature that defines different types of wetlands. If the vegetation changes in a wetland, then the ecological functioning of the wetland also changes. Ecological function includes animals supported by the wetland and how the wetland *processes* materials such as nutrients from the surrounding land. In other words, wetlands function very differently depending on respective vegetation. Littoral zone vegetation and the vegetation located around the margin of the lake also serves a critical role in providing important animal habitat as well as playing a role in maintaining good water clarity in shallow lakes. Water chemistry in lakes is important because it is related to a *variety* of biogeochemical *processes* that strongly influence *plant* and animal communities. In other words, when a key feature of a lake such as alkalinity 'significantly' changes, then other features of the ecosystem are altered. For example, if alkalinity decreases to very low levels, a lake or wetland will become highly sensitive to acidification as a result of acid rain – the pH will drop and the *plant* and animal species that are not adapted to low pH's will die out.

III. CAN EXISTING DATA BE USED TO CLASSIFY LAKES IN A WAY THAT RELATES TO HOW MUCH GROUNDWATER INPUTS THEY RECEIVE RELATIVE TO OTHER SOURCES OF WATER?

Approach: Analyze the existing geographic databases that have been developed for the *Process* and from other sources. Develop a lake classification that groups lakes into classes that receive a similar proportion of their water input from groundwater. It is assumed that lakes within the classes would respond similarly to water withdrawal. Because substantially more data are available for Michigan lakes, only lakes are considered for this question.

Summary Finding: For this analysis, only lakes were considered, not wetlands, because substantially more data exists on lakes from multiple sources. Several existing geospatial databases were used for this analysis including:

- Those used by the current *Process*.
- Those developed by *DNR*- Institute of Fisheries Research personnel that included lake watersheds, geology, and measures of lake connectivity to streams for approximately 11,000 lakes.

- Those developed by MSU-Department of Fisheries and Wildlife personnel that included lake water chemistry, watersheds, and measures of lake connectivity to streams for ~600 lakes; and those developed by USGS personnel on lake water chemistry, ecoregion and hydrology.

Many lake ecological functions are strongly related to water chemistry. For example, alkalinity has been shown to be linked to the relative proportion groundwater entering a lake compared to other sources (i.e., rainfall or streamflow). A simple classification was attempted using available geospatial databases and lake alkalinity. Unfortunately, it was not possible to develop such a classification system for lakes using available datasets. Based on past research on alkalinity in lakes in Michigan and other nearby states, the *Council* believes it should be possible to develop a lake classification for alkalinity or another measure of groundwater contribution, but further study is needed to accomplish this for Michigan lakes.

IV. HOW MIGHT WATER WITHDRAWALS CURRENTLY CHARACTERIZED AS ACCEPTABLE BY THE *PROCESS* ALTER LAKE AND WETLAND WATER LEVELS OR VOLUME? ARE THERE SOME LAKE AND WETLAND TYPES THAT MAY BE MORE ‘SENSITIVE’ TO WITHDRAWAL THAN OTHERS?

Approach: Conduct a series of hydrological ‘scenarios’ in a wide range of different water management areas. For example, calculate the proportion of lakes and wetlands that would decrease in volume by certain amounts as a result of allowable withdrawals. Because substantially more data are available for Michigan lakes, only lakes are considered for this question.

Overall Findings: For this question, we again focus on lakes because of data availability. Two main existing geospatial databases were used for this analysis: the database developed and used for the current *Process* and the database developed by *DNR*- Institute of Fisheries Research personnel that includes lake watersheds, geology, and measures of lake connectivity to streams for approximately 11,000 lakes. Michigan is blessed with a phenomenal number of lakes: 11,200 lakes over 5 acres in size, of which 7,100 are over 10 acres, and 2,000 of these are over 50 acres. They are widely, but not uniformly, spread over the Michigan landscape. About 40% of the 5600 water management areas used in the *Process* have at least one lake over 5 acres.

The *Council* attempted to identify which lakes might be most threatened by withdrawals that would be approved by the *Process*, using a relatively coarse analysis of lake volume changes using available geographic databases. The analysis was based on two factors thought to be related to a lake’s response to withdrawal; the volume of the lake and the location of the lake. In particular, the size and location of the withdrawal relative to the lake, as well as the size and location of the lake in the surrounding watershed, was considered.

For this analysis, lakes were divided into three categories that relate a lake and the stream network in its watershed. This relationship is important because it determines a lake's relative water source and thus should be related to a lake's overall response to water withdrawal. The three categories are: a) disconnected lakes in which there is no stream connection, no surface water inlet or outlet, and the lake's hydrologic connection is to groundwater; b) headwater lakes in which there is an outlet stream from the lake, but no inflowing streams; and c) in-line lakes in which the lake has both an inlet and outlet stream. In-line lakes may be positioned anywhere from the lower to the upper reaches of the watershed and the location determines how much streamflow is available to maintain the lake level. Of the 11,200 lakes over 5 acres, 5,300 are disconnected, 1,700 are headwater, and 4,200 are in-line.

Using these lake categories, several statements can be made based on hydrologic understanding of these ecosystems. Disconnected lakes are not affected by surface withdrawals from streams. They may be impacted by groundwater withdrawals through reductions in water level, and their water levels are most vulnerable to direct withdrawals from the lake itself. Headwater lakes can be impacted by groundwater and direct surface withdrawals (similar to disconnected lakes), but the flow exiting through the outlet channel represents water that does not directly support the lake's ecological systems. The flow out of in-line lakes also represents water that is not directly needed to support the lakes ecological systems. Thus, lakes with larger flows out (e.g., at lower positions in the watershed or larger lakes) are provided greater buffering from the effects of withdrawals. These statements are of course relative as a very large withdrawal has the potential to "overwhelm" a relatively small water body. In sum, lakes can be easily classified by size and location, but the utility of the classification is relative to the size of a potential withdrawal. Therefore, this approach may be useful as part of a future screening *process*, but it is not usable to classify lakes solely on this measure at the present time.

To further explore if there might be a simple, automatic way of screening lakes, we ran a simple analysis. In this analysis, the entire available withdrawal for a water management area based on the *Screening Tool* was assigned to a lake within that water management area. Then, two possible *scenarios* were used. The first simulated removal from the lake volume with no replenishment from the surrounding groundwater. The second simulated removal by treating the lake as a large "well", where groundwater is drawn into the lake (replenishment) as the lake level drops. No replenishment is the simplest and most conservative approach; it will overestimate the lake drawdown because it doesn't include groundwater seepage. The second *scenario* is a little more sophisticated, and uses the same aquifer characteristics used by the streamflow depletion model in the current *Screening Tool*. Neither approach resulted in a generalizable result that could be broadly applied statewide. The amount of water withdrawal in some water management areas currently allowed under the *Process* (because it does not cause an *ARI* to that stream segment) is likely to result in significant

volume changes in some lakes. Some small lakes occur in water management areas with high available withdrawals because they are adjacent to large rivers, these small lakes can apparently be significantly impacted just based on volume considerations. Conversely, rather large lakes can fall into water management areas with low available withdrawals and sustain negligible changes to water levels. While these approaches can not be used as part of an independent classification system, they could be useful in developing a future *Screening Tool*.

Although placing lakes into categories based on their connectivity to the stream network was an important first step in quantifying the potential impact of water withdrawal on lakes, the above analyses did not allow for the development of a generalizable model to identify which lakes would be most sensitive to water withdrawal.

Finding - ARI: At present, there is no quantitative model generally describing the ecological response of lakes or wetlands to levels of water withdrawals. Without such a model, it is not possible to specify a point in the ecological response that could be used as an objective standard for defining an *ARI*, and consequently for defining the most sensitive ecosystems. Correspondingly, it is not possible to identify lakes and wetlands that are at risk from water withdrawal under the current *Process* for assessing the impacts of withdrawals on stream segments.

Summary Finding: The answer to the above two questions is more complex than could be addressed in these initial analyses. There are likely avenues that were not adequately explored in the above analyses. For example, due to time constraints, the *Council* was not able to fully integrate all datasets, or conduct a full statistical analysis on available datasets. Based on all of the above findings, it appears to be technically feasible to develop quantitative models generally describing the ecological response of lakes or wetlands to water withdrawals, but only after additional targeted scientific research and sufficient analytical time and attention.

Recommendation

Based on the literature evidence, information from technical experts, and an initial analysis of existing applicable databases, the *Council* recommends the development of a quantitative model describing the response curves of lakes and wetlands to water withdrawals. This model should be developed so that it could be used in the legislative *process* to define an *ARI* standard for lakes and wetlands. Following definition of an *ARI* standard, a *Screening Tool* that identifies sensitive lakes and wetlands that are not adequately protected by the current stream-based *Process* should be developed.

To address this recommendation, a carefully designed rigorous field-based scientific study should be conducted to develop a quantitative model of response curves for lakes and wetlands analogous to the model developed for streams. The main steps to this study include:

- a) Classifying lakes and wetlands into discrete types that will respond similarly to water withdrawal (e.g., question IV)
- b) Selecting a range of possible indicator metrics to test and evaluate (e.g., question II) in the above classes to identify: (I) those that are most strongly related to water withdrawal, (II) those that are also easy and relatively inexpensive to measure, and (III) those that are likely to be accepted as proxies for water withdrawal impacts to lakes and wetlands.
- c) Developing quantitative models relating lake and wetland responses to water withdrawal by lake and wetland type (e.g., questions II-IV)
- d) Determining if the current *Process* adequately protects lakes and wetlands from the effect of withdrawals, based on the above models.
- e) Developing, if necessary, an additional *Screening Tool* for lakes and wetlands beyond the current *Process*.

REVIEW OF WATER LAW CONFLICTS

Charge and Findings

Subsection 32803(4)(e) of Part 328, Aquifer Protection, of the Natural Resources and Environmental Protection Act (*NREPA*), MCL 324.32801 *et seq*, charges the *Council* with, "Mak[ing] recommendations on reconciling conflicts in state law related to the use of the waters of the state." This required that we first examine whether there are state laws relating to the use of the waters of the state that actually conflict. The *Council* assumed "state law" encompassed both statutory and common law, and evaluated three possible areas of conflict: (1) between statutes; (2) between statutes and the common law; and (3) between common law principles. "Conflicts" were interpreted to mean situations where more than one statutory provision or common law principle could apply to a certain set of facts, but where applying them would lead to inconsistent results. If there were such conflicts, we would have then proposed recommendations to resolve those conflicts. As no clear conflicts in state law related to the use of the waters of the state, the *Council* does not recommend any action by the Legislature to address conflicts in state water law at this time.

Analysis

Generally speaking, courts will seek to avoid conflicts in the law, and if there are conflicts, attempt to reconcile them. For example, courts will attempt to reconcile potentially conflicting statutes to give effect to each statute. *In re Midland Pub Co*, 420 Mich 148, 163 (1984). But if a conflict is found, there are various rules for resolving that conflict. For example, if two statutes are found to conflict, the more specific will control over the general. *Eyde v Charter Twp of Meridian*, 149 Mich App 802, 814 (1986). If a statute conflicts with the common law, the statute will prevail. *Trentadue v Gorton*, 479 Mich 378, 390 (2007). Each of the three areas of potential conflict identified above was evaluated within this legal context.

The *Council* evaluated whether the amendments to Part 327, Great Lakes Preservation, of the *NREPA* created a conflict with existing state laws. But §32728 of Part 327 makes clear that the statute is not intended to create a conflict with other statutes or the common law:

This part shall not be construed as affecting, intending to affect, or in any way altering or interfering with common law water rights or property rights or the applicability of other laws providing for the protection of natural resources or the environment or limit, waive, cede, or grant any rights or interest that the state possesses as sovereign for the people of the state in the waters or natural resources of the state.

Thus, the *processes* provided for in Part 327 may authorize a withdrawal but the statute itself makes clear that this does not change the legal rights and obligations of the person proposing a withdrawal in relation to common law rights of the public, a

neighboring property owner, or another riparian. It also doesn't exempt the proposed withdrawal from other statutes. So, for example, if constructing a well would require fill in a floodplain or wetland, the person proposing the withdrawal would still need any necessary permits under the statutes regulating those water resources to construct the well.

Subsections 32723(6)(d) and (f) of Part 327 also require that before issuing a permit *DEQ* determine that a withdrawal is "reasonable under common law principles of water law in Michigan" and "will not violate public or private rights and limitations imposed by Michigan water law or other Michigan common law duties." Again, this indicates the Legislature's intent that Part 327 not conflict with other statutes or common law principles.

There is overlap among the numerous other statutes that regulate use of waters of the state. For example, the construction of a dam regulated by Part 315, Dam Safety, of the *NREPA*, will likely involve impacts to a stream or lake regulated by Part 301, Inland Lakes and Streams, of the *NREPA*, or a wetland regulated by Part 303, Wetland Protection, of the *NREPA*. [See Appendix A – Inland Lakes and Wetlands, attached, providing a summary of major statutes and common law that impact these water resources] But most of these statutes provide that a permit under one statute doesn't excuse compliance with other statutes, for example, §31529(1) of Part 315 of the *NREPA* ("This part does not abrogate requirements of Parts 31, 91, 301, 303, 305, 307, and 483 or other applicable law."); or contemplate coordination in applying other statutes, for example, §3104(8) of Part 31 of the *NREPA* ("A project that requires review and approval under this part and 1 or more of the following is subject to only the single highest permit fee required under this part of the following [listing Parts 301, 303, 323, and 325].").

Further, most of these statutes expressly provide that they are not intended to interfere with or alter the common law rights of other property owners or the public, for example, section 30111 of Part 301 ["This part does not deprive a riparian owner of rights associated with his or her ownership of water frontage..."], or, like Part 327, expressly require that *DEQ* consider those rights, for example § 30106 of Part 301 ("The department shall issue a permit if it finds that the structure or project will not adversely affect the public trust or riparian rights.") Even without such express language, *DEQ* has construed the issuance of permits under statutes regulating water use as not altering common law rights. All such permits issued by *DEQ* contain provisions expressly stating that the permit is not intended to grant or alter property rights.

An argument that there is a conflict between certain statutes governing water use has historically been raised in cases involving the establishment of a legal lake level under Part 307, Inland Lake Levels, of the *NREPA*. Part 307 establishes a *process* and sets forth criteria for a circuit court to set the level of a lake and provide for its maintenance. This typically involves lowering or raising the natural lake level, building or altering structures in lakes, streams, or wetlands, and can involve construction of wells to augment a lake level – all activities that are regulated under other statutes. And in

several cases brought under Part 307 parties argued that a court ordered lake level negated the need for otherwise applicable permits under other parts of *NREPA*. But the Court of Appeals in *Tawas Lake Improvement Association v Iosco Co Board of Commissioners*, 2003 Mich App LEXIS 1598 at *8-9 (2003), determined that there was no conflict between Part 307 and other applicable statutes, and that the permitting requirements of otherwise applicable statutes must be met even where a court had established a legal lake level. Although an unpublished decision, and therefore not binding on other courts, the *Tawas Lake* decision is the only decision from a Michigan appellate court addressing this issue, and we are informed that in the vast majority of proceedings initiated under Part 307 parties do not contest the need for permits under otherwise applicable statutes.

Regarding common law governance of water use conflicts in Michigan, the Court of Appeals recently provided clarifications/guidance in *Michigan Citizens for Water Conservation v Nestle Waters North America, Inc.* 269 Mich App 25 (2005). That case involved a dispute between a groundwater user (Nestle's bottled water operation) and users of surface water and wetlands, including riparians on affected lakes and streams, who alleged that the withdrawal of water was harming their interests. In its opinion, the Court of Appeals reviewed decisions from the 1800's to the present, to determine the legal standard to be applied in a dispute between groundwater and surface water users. The Court determined that Michigan courts had historically applied what it termed "the reasonable use balancing test" for resolving conflicts between all types of water users – riparian vs. riparian, groundwater user vs. groundwater user, and riparian vs. groundwater user. *Nestle* at p 55. That test involves applying various factors, including (1) the purpose of the use, (2) the suitability of the use to the location, (3) the extent and amount of the harm, (4) the benefits of the use, (5) the necessity of the amount and manner of the water use, and (6) any other factor that may bear on the reasonableness of the use. The *Nestle* decision determined that a single test would be applied in evaluating disputes between all types of water users and, accordingly, resolved any conflict in common law principles governing water use disputes.

Summary Findings

The *Council* has evaluated state law governing water use, both statutory and common law, and has not found any clear conflicts in those laws that need to be addressed by the Legislature. This area of law is complicated and contentious. There have been and will continue to be legal disputes among water users, affected third parties, and state agencies. And in these disputes, arguments will no doubt be made that there are conflicts in various laws governing water use. But given the general premise that the law will seek to avoid and reconcile conflicts, our review does not disclose any clear conflicts requiring action by the Legislature to address conflicts in state water law.

MICHIGAN WATER CONSERVATION MEASURES

In accordance with Article 304 paragraph 1 of the *Compact*, the *Regional Body* adopted basin-wide conservation and efficiency objectives on December 8, 2008. With passage of 189 PA 2009, the *Council* is directed by to “*Make recommendations on the development and implementation of the state’s water conservation and efficiency program under section 4.2 of the Compact.*”

Work Summary and Recommendations

The focus of work was creating a Michigan Water Conservation and Efficiency Initiative that is consistent with regional goals and objectives adopted by the *Regional Body* compliant to the *Compact*. The *Council* offers the following recommendations to advance the fulfillment of the *Council* responsibilities in addition to voluntary water conservation commitments currently being met:

- The *Council* should provide public notice of Attachment B of this report titled “Michigan Water Conservation and Efficiency Initiative.” After public review, the *Council* should incorporate findings as appropriate and recommend adoption of the report as fulfillment of Michigan’s respective responsibilities under the *Compact* regarding water conservation.
- The *Council* recommends that Michigan’s representatives on the *Compact Council* suggest a conference be developed for states to share information regarding state specific water conservation programs where stakeholders can be involved. This conference would speak to the Great Lakes water conservation and efficiency objective to “Review and build upon existing *planning* efforts by considering practices and experiences from other jurisdictions.” The *Council* of Great Lakes Governors and the Great Lakes Commission are likely and possible sponsors/facilitators of such an event.
The *Council* should continue work on water conservation for the purpose of developing a greater inventory of current conservation measures employed by business and opportunities for developing market based incentives for water conservation.

PREVENTATIVE MEASURES AND ADVERSE RESOURCE IMPACTS

The *Council* was charged to develop a framework for evaluating “*preventative measures*” designed to prevent *ARIs*. As defined in statute, a “preventative measure means an action affecting a stream or river that prevents an adverse resource impact by diminishing the effect of a withdrawal on stream or river flow or the temperature regime of the stream or river.” This section provides a background on statutory constraints for a possible framework for evaluating a *preventative measures*, respective roles and responsibilities of different parties (i.e., the applicant and *DEQ*), and a proposed, basic framework for the evaluation of *preventative measures*. The *Council* also identified several topics for further discussion that have the potential to greatly improve the basic framework presented here. The *Council* will continue to discuss these other topics and make further recommendations as appropriate in the 2011 Report.

Several statutory requirements need to be considered in developing a framework for evaluating the application of *preventative measures*:

- A person is to apply for a water withdrawal permit by submitting an application to the department and an evaluation of existing hydrological and hydrogeological conditions. If the applicant proposes to undertake a preventative measure along with the withdrawal, the application must include a detailed description of the preventative measure and relevant information as to how the preventative measure will be implemented. The permit application fee is \$2,000.00.
- In reviewing a proposed preventative measure, *DEQ* is to consider the effect of the preventative measure on preventing an adverse resource impact by diminishing the effect of the withdrawal on stream or river flow or the temperature regime of the stream or river. If *DEQ* approves a preventative measure in conjunction with a water withdrawal permit, the *DEQ* is to enter into a legally enforceable implementation schedule for completion of the preventative measure.
- *DEQ* is to issue a water withdrawal permit if the withdrawal will be implemented so as to ensure that the proposal will result in no individual or cumulative *ARIs*.

In summary, if a proposed new large-quantity water withdrawal is predicted to cause an *ARI*, the applicant has the option of submitting a permit application with a proposal to undertake *preventative measures* to alleviate or prevent the unallowable extent of predicted impact. *DEQ* then has the responsibility to review the permit application, collect a permit application fee and issue the permit if applicable conditions are met. *DEQ* can only issue a water withdrawal permit that includes a *preventative measures* proposal if *DEQ* concludes that the preventative measure will prevent any adverse impact from occurring and will be implemented so as to be effective prior to the predicted impact occurring from the new withdrawal.

Findings

The findings of the *Council* regarding *preventative measures* are as follows:

II. CONSIDERATION OF A PREVENTATIVE MEASURE IS EMBEDDED IN THE PERMIT *PROCESS*.

It is unlawful to develop a new large-quantity water withdrawal if it will create an adverse resource impact. As such, proceeding with a withdrawal predicted to cause one, but contingent upon a successful preventative measure implementation is embedded in the water withdrawal permit application *process*. That is, in considering a water withdrawal permit that depends upon a preventative measure, the *DEQ* needs to determine that the preventive measure will prevent the predicted adverse resource impact from occurring.

DEQ will ensure that a legally enforceable implementation schedule for the preventative measure is part of the permit conditions. If an approval of a water withdrawal permit that includes consideration of *preventative measures* is dependent on an arrangement between the applicant and a third party, *DEQ* will also ensure that the permit is contingent on the appropriate legal contracts between applicant and third parties.

III. CERTAIN GENERAL CATEGORIES OF INFORMATION WILL NEED TO BE PROVIDED TO THE *DEQ* TO EVALUATE THE MERITS AND LIKELIHOOD FOR SUCCESS OF A PROPOSED PREVENTATIVE MEASURE.

In evaluating a proposed preventative measure, the *DEQ* will need to consider the following:

- a. Theoretical Basis. The application must present a scientifically sound *explanation* of the proposed activity and how it will affect streamflow and/or temperature, and how an *ARI* will be prevented. This should include calculations that quantify the expected results. It should also include discussion of other possible undesirable consequences of performing the proposed preventive measure.
- b. Whether the proposed preventative measure has this been tried before. If so, the applicant should supply information on what was done, the results, and discussion of how the results can inform the decision on the proposed preventative measure.
- c. Supporting data. Data *comparing* baseline conditions with the measured or anticipated effect of the proposed preventative measure should be part of the application.
- d. Successful project. An application must include a clear description of expected results from a successful project, including a description of the measureable characteristics of a successful project.
- e. Proposed withdrawal. The application should describe the conditions under which the proposed withdrawal may begin. This includes the time

frame for initiating the preventative measure, the timing of its projected impact on stream flow or temperature, and when the withdrawal would be begin in relation to these events.

- f. Monitoring *plan*. The application must include a *plan* to collect data necessary to document success the effect of the proposed preventative measure in relation to the effect of the proposed withdrawal. The *plan* should discuss how long monitoring must continue, and under what conditions it may end.
- g. Contingency *plan*. The application should include a contingency *plan* describing actions to be taken if monitoring results are not consistent with the project overall effect of the preventative measure and withdrawal.

IV. TARGETED *PLANNING* AND DATA COLLECTION **IS NECESSARY** TO SUPPORT A PERMIT APPLICATION CONTAINING A PROPOSED PREVENTATIVE MEASURE.

Given the information needs discussed above, designing and supporting a decision on a proposed preventative measure will take the time and will be expensive. It will therefore be important to design a proposal with potential merit early in the *process* and to collect the right amount of information to support a regulatory decision. To do otherwise would be a waste of the applicant's resources in preparing the application and inefficient for the *DEQ* in reviewing it.

RECOMMENDATIONS:

- I. THE *DEQ* SHOULD DEVELOP A *PROCESS* THAT ASSISTS A PERSON IN CONSIDERING AND PREPARING A PROPOSED PREVENTATIVE MEASURE PERMIT APPLICATION.

The *DEQ* should provide the following information and assistance regarding proposed preventative measure:

- a. Include information on an applicant's options in a site specific review concluding that a proposed withdrawal would cause an *ARI* and information on the applicant's options. This includes: 1) modifying the proposed withdrawal, 2) discussions with other affected water users (and a water users committee if one exists), and 3) the process for developing a proposed preventative measure permit application.
- b. Providing opportunities to meet with the applicant to discuss the potential for developing a successful preventative measure permit application and the type of information that would be necessary to support a successful application. These opportunities may occur in stages with initial conceptual discussions followed by more detailed and site-specific discussions.

- c. Review and comment on a specific *plan* to collect and develop the necessary information to be contained in a proposed preventative measure permit application.

II. THE DEPARTMENT SHOULD DEVELOP A *PROCESS* TO PROTECT A PERSON CONSIDERING A PROPOSED PREVENTATIVE MEASURE PERMIT APPLICATION FROM LATER POTENTIAL WATER USERS.

As discussed, it will take time and funds to develop a proposed preventative measure permit application. The person considering doing so should be able to “reserve” any available flow—and flow that might be made available through a potential preventative measure—much like a person can reserve flow for 18 months simply by filing a registration. This 18 month time frame appears generally appropriate to design and collect information necessary to support a proposed preventative measure permit application as well. This flow would not become actually available for use until the permit application and preventative measure are actually approved.

III. THE *COUNCIL* SHOULD CONTINUE TO EVALUATE AND CONSIDER ISSUES ASSOCIATED WITH THE CONCEPT OF *PREVENTATIVE MEASURES*

In considering the concept of *preventative measures*, the *Council* has identified several related issues and questions that deserve further discussion and refinement in order for the *preventative measures* program to function efficiently and provide incentives for a variety of interested parties to participate. Therefore, the *Council* will continue to discuss these issues and will make recommendations on refinement of the *preventative measures* framework as appropriate with a commitment to further addressing this issue within 2011 report of the *Council*. The following are a few examples of topics needing further attention.

- Reservation of water volumes in the accounting for “*preventative measures*” proposals not associated with a current application to withdraw (i.e., incentives for current users to reduce their impact, or improvements to flow or temp paid for by conservation organizations intended to improve conditions beyond 2006 status).
- Appropriate tracking and accounting in water use database for the successful execution of a preventative measure (e.g., if a preventative measure improves a cool stream into a cold-transitional stream – thus improving the stream but limiting the amount of available water for withdrawal). Also, considerations for *preventative measures* in the development of *DNR* protocol for changing stream segment classifications
- Development of more specific *preventative measures* application templates for *preventative measures* applications that become routine (e.g., dam removal), to improve efficiency of review *process*.

- Review of sufficient application fees to evaluate complex *preventative measures* applications.
- Use of the Water Management Science Advisory Committee for the evaluation of complex *preventative measures* applications.
- Addressing the retirement of existing water uses in the *preventative measures* context.

EDUCATION NEEDS OF MICHIGAN’S WATER WITHDRAWAL PROGRAM

Charge and Background

Public Act 189 of 2008 requires the *Council* to: “In consultation with academic institutions and other non-profit organizations, make recommendations regarding educational materials related to the use and availability of water resources.” Given the expected importance of two key groups in the *Process*, those being the Water Resource Assessment and Education Committees and the Water User Committees, the *Council* chose to focus on their information needs in order to facilitate their formation and optimize their effectiveness regarding respective roles in the *process*.

Water Resource Assessment and Education Committees

The Water Resource Assessment and Education Committees may be formed by local concerned organizations who have requested to be notified of water withdrawal proposals in their defined watershed. The local Water Resource Assessment and Education Committee will provide a formal structure for organizations to assess trends in water use in the defined watershed, educate water users, and respond to withdrawal proposals with supplementary information and comment. It should be noted that the committee can be formed at anytime, including prior to notification by *DEQ*. *DEQ* shall assist in the formation of these water resources assessment and education committees and may provide them with technical information regarding water use and capacity within their watershed. Organizations such as Conservation Districts, Regional *Planning* Agencies, Watershed Management *Planning* Committees, Storm Water Committees, Chief Elected Officials of local units of government, community supplies owned by political subdivision and others can form and participate in these committees. Additionally, a watershed *council*, or some other similarly-focused group, may decide to form a Water Resources Assessment and Education Committee before any potential adverse resource impact is occurring – and thus get a head start on researching important water use trends information for their community. This would be an ideal situation, especially in areas of the state that have ever been prone to water availability problems.

Water User Committees

Water User Committees are a tool for water users to cooperate in their use of local water resources and make decisions on how best to accommodate or adjust for new or expanded uses. This committee, like the Water Resources Assessment and Education Committee, can also form right away; they do not have to wait for a Zone B withdrawal in a cold transitional river system or a Zone C withdrawal. This committee may be composed of all registrants, permit holders and local government officials in a watershed. This committee can evaluate the status of current water resources, water use and trends in water use within the watershed and to assist in long-term *planning* of water resources. By taking a proactive approach these users can take ownership in protecting their watershed and also be prepared to take action if a withdrawal falls into a Zone B cold transitional river system or Zone C withdrawal.

Water User Committees are to be composed of the major water users in a defined watershed. The report titled Water Withdrawals for Major Water Uses in Michigan 2004 (<http://www.deq.state.mi.us/documents/deq-wd-wurp-report04.pdf>) indicates that the four largest water uses in Michigan are for thermoelectric power generation, public water supplies, self-supplied industrial users, and irrigators. The Great Lakes Commission (<http://glc.org>) compiles water use data for the Great Lakes Basin. In its Annual Report of the Great Lakes Regional Water Use Repository Database representing 2004 Water Use Data in Gallons, (<http://www.glc.org/wateruse/database/pdf/2004-gallons.pdf>), the Great Lakes Commission further breaks down the major categories to public supply, domestic supply, irrigation, livestock, industrial, fossil fuel power, nuclear power, hydroelectric power, and others.

Water users by industry sector in any given watershed, then, would be dependent on the dominant land use base in that watershed. More urbanized areas of the state, like Detroit and suburbs, and Grand Rapids and suburbs, and Lansing and suburbs, would have a large mix of users, and certainly most of them industrial and municipal – but probably relatively little agriculture. Other areas of course are far more rural and a Water Users Committee may include a number of irrigators, livestock producers, as well as turf grass producers, and golf courses.

Water Users Committee may proactively communicate, perform water research and *planning* before any potential problem occurs (i.e. conflict, *ARI*) prior to notification. *DEQ* is directed to notify all registrants and permit holders, if they determine that adverse resource impacts are occurring or likely to occur from 1 or more large-quantity withdrawals.

Other Opportunities for Public Involvement

When a Water Users Committee is formed, local officials have the option of forming an ad-hoc subcommittee of local residents to provide the local government official with information and advice on water resources, water use, and trends in water use within the local unit of government. Realistically, many municipalities and townships already have natural resource committees made up of local residents, and these or a subset may form the basis of a water-use ad-hoc committee. This is an important tool for the local public officials because they might not have the background in water use, so this allows the official to have some expert residents provide the official with this information to use within the water users committee. This also allows the residents to have a voice in the *process* by advising their local public official.

This legislation requires *DEQ* to notify all registrants, permit holders and local government officials within the impacted watershed if the department authorizes a Zone B withdrawal in a cold transitional river system or a Zone C withdrawal. *DEQ* must also notify these groups of the authority under the legislation to establish a water users committee, if they have not already done so. The *DEQ* may also provide them with technical information regarding water use and capacity within their watershed aggregated at the stream reach level.

The *DEQ* director can impose a restriction on a withdrawal for up to 30 days if the director can determine by clear and convincing scientific evidence that there is a substantial or imminent threat that a withdrawal is causing an *ARI*. This order can also be extended for 30 days if there is still clear and convincing scientific evidence. This authority of the *DEQ* is another reason for registrants, permit holders and local public officials to form the Water Users Committees as soon as possible because if they form the committees and work together they can be prepared to handle a possible *ARI* in their watershed instead of having the *DEQ* offer solutions or put in temporary restrictions.

Existing Educational Materials and Needs

The various committee responsibilities that will require educational materials and technical data include some of the following:

- Evaluation of current water resources in a watershed.
- Providing information and advice on water resources, water use and trends in water use.
- Educating all water users.
- Proposing solutions to an *ARI*.
- Managing water resources in the watershed.
- Assisting communities in long term water resources *planning*.
- Developing technical information regarding water use and capacity within their watershed aggregated at the stream reach level.
- Hosting meetings for the general public and other interested parties.

In addition, these committees are also encouraged to fully understand existing water use and trends in water use within their watershed and to work together to help communities in the watershed develop long-term water resources *planning*.

DEQ is also required to assist in the formation of committees and may provide them with technical information regarding water use and capacity within their vicinity, aggregated at the stream reach level. Meetings are open to the general public, and the committees are encouraged to provide educational materials and recommendations regarding long-term water resources *planning*; use of conservation measures; drought management activities; and any other topics related to water use.

Once these committees are formed, it will be most helpful to them to have an annotated list of existing materials. The list, located in Appendix C of this report, is separated into three categories of educational materials; essential items, background resources and additional resources. As the user progresses through the list, the information gets progressively more technical in order to meet the needs of users that want different levels of detail and technical assistance. This list should be maintained as an ongoing resource with updates and additions of materials as new research and technical data are developed over time.

If the committees take advantage of all the material listed in Appendix C of this report, there is very little information they will still require. The essential materials section educates them on Michigan law and how to use the *Process and Screening Tool*. It also provides information on existing water wells that is needed to make informed decisions, and what conservation measures are in place for any relevant sector in their watershed.

These materials provide information on the geographical and physical properties of their watershed in addition to reports about water use across the Great Lakes Basin. This information can be used to committee locations with other similar areas of the state. The materials in Appendix C also provide relevant sources for economic data related to water use, and what steps could be taken to conserve water in their watershed, when necessary.

These materials can be found on the web using personal computers that belong to individuals or businesses, in addition to being accessible through public libraries. There is a vast amount of data available and if the committees take advantage of the resources listed, they should be able to complete their tasks within a reasonable time frame.

In addition to the materials listed above, the *Council* strongly recommends that committees ask for help from experts. Their first resource is the *DEQ* and *DNR*. Both departments have experts on staff that could assist these committees with advice regarding specific technical data they might require.

Many other organizations that can provide technical assistance and resource materials include the following:

- **The Instream Flow Council** (www.instreamflowCouncil.org) is an organization that represents the interests of state and provincial fish and wildlife management agencies in the United States and Canada dedicated to improving the effectiveness of their instream flow programs. It consists of a Governing *Council* of appointed instream flow representatives of these agencies.
- **The Nature Conservancy's (TNC) Environmental Flows Program** (<http://www.tnc.org> also www.nature.org/initiatives/freshwaterz). draws on fifty years of on-the-ground experience and is engaged at 600 water sites in 30 countries, employing rigorous science.
- **The Institute of Water Research (IWR) at Michigan State University** (<http://www.iwr.msu.edu/>) addresses contemporary land and water resource issues through coordinated multidisciplinary efforts using advanced information and networking systems.
- **The United States Geological Survey** (www.usgs.gov) is a leading repository of spatial water resources information.

- The **Institute for Fisheries Research** (http://michigan.gov/dnr/0,1607,7-153-10364_52259_10951_18964---,00.html) is a cooperative unit of the Michigan Department of Natural Resources (DNR) and the University of Michigan (UM) that conducts research on fisheries and other aquatic resources of Michigan. The Institute created the science underpinnings of the *Screening Tool*.
- The **Robert B. Annis Water Resources Institute (AWRI)** at Grand Valley State University (<http://www.gvsu.edu/wri/>) is a multidisciplinary research organization committed to the study of freshwater resources. The mission of the Institute is to integrate research, education, and outreach to enhance and preserve freshwater resources.

Findings

Long-term water resources planning can be provided by the local Water Resource and Education Committees to users so they can learn to use water management which reflects the philosophy that water resources should be managed for the greatest good for people and the environment, with opportunities for participation in water policy by all segments of society. Long-term state and local government commitment is necessary to ensure the protection of high quality water resources so they remain available to future generations.

Water conservation is a key link between balancing current and future water use. The committee will provide tools to help individuals, companies, agriculture, etc. have resources available to assist water users to conserve water and these tools will allow users to efficiently manage their watersheds water resources. The Water Resource and Education Committees can relay to the public the importance of drought management and drought contingency *plans* as an inexpensive way to extend existing water supplies to insure critical water needs are met during dry periods, reduce peak demands, reduce economic impacts, reduce environmental impacts and reduce social impacts. This is an important part of the legislation that allows Water Resource Assessment and Education Committees to play an integral part in educating people on water use and protection.

Recommendations

The *Council* recommends the following:

- Water User Committees and Water Resources Assessment and Education Committees should proactively meet, communicate, and plan for managing their water, and therefore avoid causing an adverse resource impact. If Water User Committees and Water Resources Assessment and Education Committees proactively meet, communicate, and *plan* for managing their water, it's less likely that an *ARI* would occur. If, however, they do not, then finding common ground in a workable solution may be problematic, if given only 30 to 60 days. At the

outset of a 30-day *ARI* correction or avoidance timeframe, the water user committee may find it necessary to evaluate each user's water use. By forming Water User Committees earlier instead of when notified of these Zone B and C withdrawals the users in the watershed would be better prepared to assess the impacts on their watershed. This knowledge would be important for them to use as the next withdrawal could possibly throw the area into a Zone D which means the withdrawal will cause an adverse resource impact.

- A *Process and Timeline Guidebook* should be constructed for the committees named in the new laws. The purpose of the guidebook would be to foster effective implementation of these new committee mechanisms and collaboration from both major water users and the local community. We suggest that straightforward guidance for their formation and operation must be provided, and clear information regarding the water withdrawal assessment *process* and water conservation in general must be available. This could be written by academics, but it should be provided by the state and made available when these committees are formed.
- The annotated list of materials provided in this report in Appendix C should be made available on the *DEQ* and *DNR* websites, in addition to being included in the *Process and Timeline Guidebook* which would also be available online.
- Water committees should look to state, federal, university and non-profit organization resources to help meet educational needs. We also acknowledge that committee members themselves may have their own technical data, such as hydrological and ecological monitoring data, that can be considered.

Appendix A: A Legal Reference Guide - Inland Lakes and Wetlands

This guide is provided for reference purposes. It includes a summary of major provisions of Michigan and federal law and regulations that can apply to activities affecting inland lakes and wetlands. It is not an exhaustive list or a complete description of the laws or legal principles that could be applied to activities affecting inland lakes and wetlands, but covers major provisions.

I. STATUTES AND COMMON LAW PRINCIPLES

A. **State of Michigan Statutes** - available at <http://www.legislature.mi.gov>

1. **Part 17, Michigan Environmental Protection Act, of the Natural Resources and Environmental Protection Act, MCL 324.1701 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-I-17>
 - Authorizes private citizens or the Attorney General to bring an action to protect the air, water, or other natural resources from "pollution, impairment, or destruction"
 - Requires state agencies to consider the potential for pollution impairment or destruction of natural resources in "administrative, licensing or other proceedings"
2. **Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, MCL 324.3101 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-II-1-31>
 - Prohibits discharges into the waters of the state that are or could be injurious to public health, safety, and welfare; requires permits for any discharge of waste into waters of state, including groundwater
 - Requires a state permit for activities that alter a floodplain or interfere with stream flow
3. **Part 33, Aquatic Nuisance Control, of the Natural Resources and Environmental Protection Act, MCL 324.3301 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-II-1-33>
 - Regulates treatment of waters for aquatic nuisance control; requires a permit or certificate of coverage for chemical treatment of waters of the state, unless exemptions apply
4. **Part 91, Soil Erosion and Sediment Control, of the Natural Resources and Environmental Protection Act, MCL 324.9101 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-II-2-SOIL-CONSERVATION-EROSION-AND-SEDIMENTATION-CONTROL-91>
 - Requires permit from county or local enforcing agency for certain earth changes pursuant to local ordinance approved by the state

5. **Part 301, Inland Lakes and Streams, of the Natural Resources and Environmental Protection Act, MCL 324.30101 *et seq* -**
<http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-301>
- Requires a permit for enlarging or diminishing an inland lake or stream; dredging, filling, or placing a structure on bottomland; erecting or maintaining a marina; connecting any natural or artificial waterway with an existing inland lake or stream; or interfering with the natural flow of an inland lake or stream
 - Permits not required for water withdrawals
 - Applies to water bodies with defined banks and evidence of continued flow or continued occurrence of water; lakes and ponds < 5 acres are not covered
6. **Part 303, Wetland Protection, of the Natural Resources and Environmental Protection Act, MCL 324.30301 *et seq* -**
<http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-303>
- Requires a permit for any of the following activities in a wetland: dredging or placement of fill; removing soil or minerals; constructing, operating, or maintaining any use or development; and draining surface water
 - Wetlands subject to permit requirements are defined in Part 303 by characteristics (hydrology, soil, and plants) and by size or adjacency to a stream or lake
7. **Part 307, Inland Lake Levels, of the Natural Resources and Environmental Protection Act, MCL 324.30701 *et seq* -**
<http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-307>
- Provides process for establishing a legal lake level and authorizes county to maintain the established level
 - Process may be initiated by county board on own motion or upon petition from 2/3 of riparian owners; state may also initiate action to determine normal lake level
8. **Part 309, Lake Improvements, of the Natural Resources and Environmental Protection Act, MCL 324.30901 *et seq* -**
<http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-309>
- Provides a process for undertaking and financing "improvements" to lakes or adjacent wetlands, including dredging or ditching
 - Requires establishment of lake boards to oversee projects
 - Standard for projects is "protection of public health, welfare, and safety and conservation of the natural resources of this state, or to preserve property values around a lake"

9. **Part 311, Local River Management, of the Natural Resources and Environmental Protection Act, MCL 324.31101 *et seq* -**
<http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-311>
- Authorizes establishment of watershed councils and river management districts by local governments with state approval
 - River management boards may petition the state to set a minimum stream flow; impound and control waters within a district, subject to any established minimum stream flows; and may adopt a river management program to address water storage and river control structures
 - There are no records of any Water Management Boards ever being created under Part 311, nor are there records of MDEQ ever making a determination of "minimum flow" under Part 311.
10. **Part 313, Surplus Waters, of the Natural Resources and Environmental Protection Act, MCL 324.31301 *et seq* -**
<http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-313>
- Authorizes county boards to petition the state to survey for "surplus water" (water that may be impounded without decreasing the flow of a river or stream below its optimum flow) and to determine how best to impound, conserve, and utilize the surplus water
 - County boards may request a state determination of "optimum flow" in any river or stream affected by impounding and releasing surplus water
 - County boards may submit plans for impoundment, including construction, operation, and maintenance of dams, for approval by state (after a public hearing and determination that plan will not interfere with optimum flow)
 - Does not apply to areas covered by a river management district created under Part 311
 - There are no records of any state determinations of "optimum flow" or plan approvals under Part 313
11. **Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, MCL 324.31501 *et seq* -**
<http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-315>
- Requires a permit for any construction, enlargement, repair, alteration, removal, abandonment, or reconstruction of a dam
 - Applies to dams six feet or more in height that impound more than five surface acres of water (other than dams permitted under the federal power act or under the jurisdiction of the U.S. Army Corps of Engineers)

12. **Part 317, Aquifer Protection and Dispute Resolution, of the Natural Resources and Environmental Protection Act, MCL 324.31701 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-INLAND-WATERS-317>
- Establishes process for resolution of potential groundwater disputes in the event that a small quantity water well owner believes that a high capacity well has interfered with the proper function of the small quantity well
13. **Part 327, Great Lakes Preservation, of the Natural Resources and Environmental Protection Act, MCL 324.32701 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-THE-GREAT-LAKES-327>
- Prohibits diversions of water from the Great Lakes Basin
 - Requires registration by property owners prior to making large quantity water withdrawal, with limited exceptions
 - Requires reporting for registered and permitted withdrawals
 - Requires permit for new or increased water withdrawal over 2,000,000 gallons per day from waters of the state or 5,000,000 gallons per day from the Great Lakes or connecting waterways
 - Prohibits large quantity withdrawal that causes an adverse resource impact to a trout stream
14. **Part 328, Aquifer Protection, of the Natural Resources and Environmental Protection Act, MCL 324.32801 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-THE-GREAT-LAKES-328>
- Created Water Resources Conservation Advisory Council and charged Council with study, evaluation, and recommendations regarding the operation and efficacy of the provisions of Part 327, including the water withdrawal assessment tool
15. **Part 341, Irrigation Districts, of the Natural Resources and Environmental Protection Act, MCL 324.34101 *et seq*** - <http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-1-THE-GREAT-LAKES-341>
- Authorizes establishment of irrigation districts for the purpose of irrigating lands to benefit agricultural crops or other agricultural operations for improvement of the food supply; irrigation districts have authority to construct dams, canals, drains, and other water control structures
 - Withdrawal of water under Part 341 prohibited if not for authorized purposes or if withdrawal will injure other users, affect lake levels, or adversely affect fish, wildlife, or the health and welfare of the people of the state

- Applies only to the use of water from the Great Lakes and tributaries to the Great Lakes where the natural water levels are controlled by and at essentially the same water level as the Great Lake involved
- Applies only in counties with 400,000 people or less

16. Drain Code, MCL 280.1 *et seq* - <http://legislature.mi.gov/doc.aspx?mcl-Act-40-of-1956>

- Authorizes creation and maintenance of designated county drains (which may include streams or lakes) by county drain commissioners
- Most activities also subject to permitting under Part 301, Inland Lakes and Streams, and Part 303, Wetland Protection, of the NREPA

B. Michigan Common Law

1. Nuisance

- Prohibits unreasonable interference with another's property
- Weighs a variety of factors, including the extent of the harm, the uses of the property at issue, and the social utility of the activity alleged to be a nuisance

2. Riparian doctrine

- Establishes certain rights in owners of property abutting lakes and streams
- Riparian rights are "correlative" – dependent on and defined by other riparians' rights

3. Reasonable Use Doctrine

- In water use context, provides rule that melds concepts of nuisance and riparian law to establish balancing test for resolving disputes between water users
- Doctrine applies to groundwater and surface water user disputes

4. The Public Trust Doctrine

- Recognizes and protects the rights of current and future citizens to use navigable waters for navigation, commerce, hunting, and fishing

C. Michigan Administrative Rules - http://www.michigan.gov/dleg/0,1607,7-154-10576_35738_5698---,00.html

1. Rules 281.811-281.846 for Part 301, Inland Lakes and Streams - available at

http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin_Num=28100811&Dpt=EQ&RngHigh=

- Provides permit application review criteria

- Requires state to find that the adverse impacts to the public trust, riparian rights, and the environment will be minimal and that a feasible and prudent alternative is not available before issuance of a permit
2. **Rules 281.921-281.925 for Part 303, Wetland Protection** – *available at* <http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin Num=28100921&Dpt=EQ&RngHigh=>
 - Provides permit application review criteria
 - Specifies wetland identification and assessment procedures
 3. **Rules 323.1041- 323.1117, Water Quality, of Part 31, Water Resources Protection** – *available at* <http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin Num=32301041&Dpt=EQ&RngHigh=>
 - Provides minimum water quality standards for surface waters of the state
 4. **Rules 323.1311-323.1329, Floodplains and Floodways, of Part 31, Water Resources Protection** - *available at* <http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin Num=32301311&Dpt=EQ&RngHigh=>
 - Provides required information for permits from state to occupy, fill, or grade lands in a floodplain, streambed, or channel of a stream, with exceptions
 5. **Rules 323.1701-323.1714, Soil Erosion and Sedimentation Control, of Part 31, Water Resources Protection** – *available at* <http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin Num=32301701&Dpt=EQ&RngHigh=>
 - Sets forth requirements for obtaining a permit from county or local enforcing agency for certain earth changes on land within 500 feet of water's edge of a lake or stream.
 6. **Rules 323.3010-323.3110 for Part 33, Aquatic Nuisance Control** – *available at* <http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin Num=32303101&Dpt=EQ&RngHigh=>
 - Sets forth activities requiring a permit from the state under Part 33, including chemical treatment of waters of the state for aquatic nuisance control, with exceptions
 - Provides required information for permit applications

D. Federal Law

1. **Federal Power Act, 16 USC § 791 *et seq.***

- Provides for regulation of hydroelectric facilities by the Federal Energy Regulatory Commission (FERC)

2. Clean Water Act, 33 USC § 1251 *et seq.*

- Prohibits discharge of pollutants or placement of dredged or fill material in waters of the United States without a permit
- Many states, including Michigan, administer the federal permitting (NPDES) program

Attachment B: Draft Michigan Water Use Conservation and Efficiency Initiative

Statement of Intent:

Michigan continues to grow and develop water conservation and efficiency programming. To fulfill obligations of the Great Lakes *Compact* and to provide a common understanding of desired outcomes, Michigan is developing water conservation and efficiency goals and objectives consistent with the Basin-wide goals and objectives as adopted by the Great Lakes – St. Lawrence Water Resources *Regional Body (Regional Body)* on December 8, 2008.

Michigan seeks to develop water conservation and efficiency goals and objectives that are

- Designed to ensure equitable access to and long-term availability of water.
- Protective of public health and enhance quality of life.
- Focused on enhancement of economic viability and competitiveness of Michigan.
- Meaningful and attainable.
- Environmentally sound and economically feasible.
- Inclusive of both voluntary and mandatory programming.
- Applicable statewide.
- Flexible and adaptable to changing conditions.
- Relevant to all water use sectors.

The goals/objectives in themselves will not establish new programs or requirements. Instead each provides a structure for state agencies and partners to measure progress in common with other Great Lakes States and to expose new opportunities to achieve goals and meet objectives.

For each of the goals/objectives offered, including the Great Lakes goals for water conservation and efficiency offered in the *compact*, a description of existing, applicable programming is detailed as a means to monitor progress. Also, Appendix I to this document is an inventory of existing Michigan water conservation and efficiency measures provided by existing law as related to water use *planning*, regulation, metering, reporting, efficiency, pricing, reuse/recycling, education and outreach.

In addition to guidance provided by the *Compact* and applicable state law, Michigan is accounting for existing applicable voluntary programming, federal programs and the continued efforts of the Michigan Water Resources Conservation Advisory *Council* and the precedent Groundwater Conservation Advisory *Council*.

Great Lakes Goals:

- Ensuring improvement of the waters and water dependent natural resources
Michigan has developed and approved sector-specific conservation measures. In the event that a sector does not supply the state with water conservation measures, the state has developed generic water conservation measures that can be voluntarily implemented or implemented as part of an authorization. Implemented

water conservation measures inherently use less water and consequently less discharge of wastewater yielding an improvement to the basin. In addition to water quantity efforts, Michigan continues to implement water quality programs such as watershed planning, ballast water laws, programs to address invasive species in addition to a robust stormwater management program. As a result of 2008 legislation, Michigan is developing water restoration measures which are focused at creating improvements to surface water flows and temperatures through the Water Resources Conservation Advisory Council (Council).

- Protecting and restoring the hydrologic and ecosystem integrity of the Basin
Michigan implemented a Water Withdrawal Assessment Process that is focused on protecting hydrologic and ecosystem integrity. In addition to assisting water users with making sound water use decisions, the Water Withdrawal Process does make causing an adverse resource impact to a stream in Michigan illegal. The definition of adverse resource impact directly links preserving stream flows for the purpose of maintaining characteristic fish populations. The process utilizes fish community health as an indicator of ecosystem integrity. In addition to the use of the assessment process, Michigan is permitting large capacity water uses as required in statute in an effort to manage and regulate withdrawals in accordance with the Compact including public involvement for permitted withdrawals and conservation measures. Council is charged with researching and making recommendations regarding the application of the water withdrawal process to lakes and other water features such as wetlands.
- Retaining the quantity of surface water and groundwater in the Basin
Michigan prohibits diversion; respecting caveats of the Compact. Michigan recognizes conservation of our groundwater and our surface water includes both the efficient use of water and also the protection of quality. In addition to implemented industry-specific water conservation measures, the Water Withdrawal Assessment Process assists some water users with site-specific review as provided by the Michigan Department of Environmental Quality. Through site-specific review, Michigan works with water users to assess withdrawal impacts, including return flow.
- Ensuring sustainable use of waters of the Basin
Michigan requires registration and reporting of water withdrawals consistent with the Compact and is implementing a Water Withdrawal Process and sector specific water conservation measures as stated. In addition to these efforts, Michigan is working with stakeholders to develop Water Education and Awareness Committees in areas where additional water withdrawals continue to propagate an area toward creating an adverse resource impact. These committees are stimulated via communication from Michigan departments to regional planning bodies, conservation districts or other local organizations such as land grant university extension services. Water Users Committees are also encouraged in areas that are approaching adverse resource impact conditions. In addition to these water quantity related efforts, Michigan implements several water quality programs to ensure the sustainable use of basin waters.
- Promoting the efficiency of use and reducing losses and waste of water
Michigan has created a structure to work with stakeholders through Water Education

and Awareness Committees and Water User Committees as mentioned. In addition to education efforts, Michigan water use permitting uses Compact standards that meet for water use efficiency review prior to permit issuance. Sector-specific water conservation measures also address this need as previously mentioned.

Michigan Adoption of Great Lakes Objectives:

Michigan is considering adoption of the Great Lakes Objectives as approved by the *Regional Body* on December 8, 2008. In addition to objectives as stated, Michigan is providing applicable guidance to current efforts to meet the stated objectives. In some cases, objectives may have no supporting comments as Michigan needs additional efforts to achieve these objectives or current programming in part fulfills an objective and additional comments are redundant.

1) Guide programs toward long-term sustainable water use.

- **Use adaptive programs that are goal-based, accountable and measurable.**
In addition to water withdrawal registration and reporting, a primary objective of Michigan's Water Withdrawal Process is that no new large capacity withdrawal will create an adverse resource impact to the ecosystem. The Process provides accountability and responsibilities for both the water user and the regulatory agencies. The process is based on quantifiable impacts to resources as a result of registered withdrawals.
- **Develop and implement programs openly and collaboratively, including with local stakeholders, Tribes and First Nations, governments and the public.**
Michigan's water withdrawal process is open to the public and the web-based Water Withdrawal Assessment Tool (tool) is unrestricted. The tool was available for public review and comment from October 2008 to February 2009. Agencies, the regulated community, tribes and the public are represented as members of COUNCIL. COUNCIL meetings are open to the public and time for public comment is offered at meetings. Sub-committees of the WCRAC are open to non-Council members. In addition to these efforts, Michigan is empowering water user committees and water education and awareness committees at the local level.
- **Prepare and maintain long-term water demand forecasts.**
- **Develop long-term strategies that incorporate water conservation and efficient water use.** *Michigan is working to meet this objective through implementation of the Water Withdrawal Assessment Process, sector-specific conservation measures, developing materials/guidance for local Water Education & Awareness Committees, encouraging water users committees and Regional Planning.*
- **Review and build upon existing planning efforts by considering practices and experiences from other jurisdictions.**
Outside of Compact Council efforts, there are minimal opportunities for this

discussion less personal experiences in professional organizations or institutions such as the Great Lakes Commission and the Council of Great Lakes Governors.

2) Adopt and implement supply and demand management to promote efficient use and conservation of water resources.

- **Maximize water use efficiency and minimize waste of water.**
- **Promote appropriate innovative technology for water reuse.**
- **Conserve and manage existing water supplies to prevent or delay the demand for and development of additional supplies.**

Michigan addresses this issue through market-driven approaches such as rate structures. In addition, Michigan works with farmers to perform efficiency reviews for irrigation systems through Farm Bill conservation programs and extension education. Michigan's water use permitting approach also looks at efficiency of existing systems prior to expansion in accordance with the compact decision-making standard.

- **Provide incentives to encourage efficient water use and conservation.**
Michigan can do more to incent efficient water use and conservation. Some current mechanisms include DEQ Pollution Prevention business loans for water conservation, utilization of Farm Bill water conservation practices in agriculture and nuisance liability protection for farmers that follow Generally Accepted and Agricultural Management Practices for Irrigation Water Management.
- **Include water conservation and efficiency in the review of proposed new or increased uses.**
- **Promote investment in and maintenance of efficient water infrastructure and green infrastructure.**

3) Improve monitoring and standardize data reporting among State and Provincial water conservation and efficiency programs.

- **Improve the measurement and evaluation of water conservation and water use efficiency.**
- **Encourage measures to monitor, account for, and minimize water loss.**
- **Track and report program progress and effectiveness.**

4) Develop science, technology and research.

- **Encourage the identification and sharing of innovative management practices and state of the art technologies.**

The Michigan Economic Development Corporation has a focused Water Technologies Initiative that is working with countries such like Israel to find new ways that water conservation can benefit Michigan's economy. Companies like Coca – Cola are working with Michigan State University and the Nature Conservancy to employ water conservation and create a “zero water use footprint”. Michigan works with USEPA to install water efficient products through Water Sense. Michigan would benefit from an opportunity to learn from other states in a conference format as previously suggested.

- **Encourage research, development and implementation of water use and efficiency and water conservation technologies.**

Michigan continues to assist with adoption of energy reducing technologies that lead to water conservation. Items like “two-button toilets” and low flow fixtures are encouraged.

- **Seek a greater understanding of traditional knowledge and practices of Basin First Nations and Tribes.**
- **Strengthen scientific understanding of the linkages between water conservation practices and ecological responses.**

As mentioned, the Water Withdrawal Assessment Process is being reviewed by the WCRAC to include other hydrologic features such as lakes and wetlands, including ecological responses. In 2007, the Groundwater Conservation Advisory Council spent significant time and resources to increase understanding of sustainability indicators led by Grand Valley State University.

5) Develop education programs and information sharing for all water users.

- **Ensure equitable public access to water conservation and efficiency tools and information.**
- **Inform, educate and increase awareness regarding water use, conservation and efficiency and the importance of water. Promote the cost-saving aspect of water conservation and efficiency for both short-term and long-term economic sustainability.**

In addition to the local water education efforts, many partners offer water conservation education to a broad array of groups. Programs include, but are not limited to, DEQ educational resources, Conservation District Envirothon programming, efforts of regional planning bodies regarding water conservation measures.

- **Share conservation and efficiency experiences, including successes and lessons learned across the Basin.**
- **Enhance and contribute to regional information sharing.**
- **Encourage and increase training opportunities in collaboration with professional or other organizations in order to increase water conservation and efficiency practices and technological applications.**
- **Ensure that conservation programs are transparent and that information is readily available.**
- **Aid in the development and dissemination of sector-based best management practices and results achieved.**

As mentioned, Michigan statute requires the development of site-specific water conservation measures and practices, including timelines for requiring review of these measures by registered users. Agriculture utilizes the structure of Generally Accepted and Agricultural Management Practices through the Michigan Right to Farm program. These practices are developed with leadership from the Land Grant University and are update annually with public comment.

- **Seek opportunities for the sharing of traditional knowledge and practices of Basin First Nations.**

APPENDIX C: MICHIGAN WATER USE EDUCATIONAL MATERIALS

ESSENTIAL ITEMS:

Considering Aquatic Ecosystems: the Basis for Michigan's New Water Withdrawal Assessment Process

<http://web2.msue.msu.edu/bulletins/Bulletin/PDF/WQ60.pdf>

This is a four-page fact sheet co-authored by Paul Seelbach and Jane Herbert and distributed by MSU Extension outlets. It briefly explains the Great Lakes *Compact* and new Michigan water laws, and then explains how the Water Withdrawal Assessment *Process* works, in detail. Recommended for both Large Water User Groups and the Assessment and Education Committees

Michigan's Water Withdrawal Assessment Tool website Education Section

<http://www.miwwat.org/wateruse/regulations.asp>

This link has the new laws and an analysis of the Great Lakes *Compact*. It also has a link to the Webinar and its related materials. Finally, there are also 3 excellent Power Point presentations. Recommended for both Large Water User Groups and the Assessment and Education Committees

MI Farm Bureau Water Resource Guide

<http://www.michfb.com/files/mfb/Water%20Resource%20Guide.pdf>

This is an extremely well done booklet, 34 pages; geared to Michigan farmers but anyone interested in how the Assessment Tool and the laws work would find it helpful. Recommended for both Large Water User Groups and the Assessment and Education Committees

Large Quantity Water Well Construction Records

http://www.michigan.gov/documents/deq/deq-wb-dwehs-wu-lqw_wellogic_256290_7.pdf

This listing contains water well construction data for wells with pump capacities of 70 gallons per minute (GPM) or greater. These wells were constructed on or after March 1st, 2006 and it is updated on a monthly basis. It includes a chart of Water Well Classifications, followed by the list of Large Quantity Water Well Construction Records by County. Recommended for both Large Water User Groups and the Assessment and Education Committees

Water Use Conservation Measures

This DEQ website page has links to Water Conservation Best Management Practices (BMPs) for the following sectors: Non-agricultural irrigation, Aggregates, Turfgrass, Public Water Supplies, Chamber of Commerce, and Department of Agriculture Generally Accepted Agricultural and Management Practices (GAAMPS)

http://www.michigan.gov/deq/0,1607,7-135-3313_3684_45331-190105--,00.html

This additional site is a three-page document that outlines Generic Water Conservation Measures developed by *DEQ* to satisfy the *Compact* requirement for states to develop Environmentally Sound and Economically Feasible Water Conservation Measures:

http://www.michigan.gov/documents/deq/deq-wb-dwehs-wateruse-genericconsmeas_273138_7.pdf

Recommended for both Large Water User Groups and the Assessment and Education Committees

BACKGROUND RESOURCES:

Groundwater Conservation Advisory Council Final Report

http://www.michigan.gov/documents/deq/Groundwater_report_206809_7.pdf

The Groundwater Conservation Advisory *Council* submitted a final report to the Legislature in July, 2007. That report completed the tasks assigned to the *Council* by Public Acts 148 of 2003 and 34 of 2006. As a result, the *Council* was eliminated by Executive Order 2007 - 8, also in July, 2007.

Partially as a result of the work of the Groundwater Conservation Advisory *Council*, the Michigan Legislature passed a series of amendments to Michigan's water withdrawal management statutes in June, 2008. These amendments were signed into law by Governor Jennifer Granholm as Public Acts 178 to 189 of 2008. Public Act 189 of 2008 amends Part 328 of the Natural Resources and Environmental Protection Act to create the Water Resources Advisory *Council* within the Department of Natural Resources.

The Great Lakes Atlas

This is a US Environmental Protection Agency (EPA) website and can be found at:

<http://www.epa.gov/glnpo/atlas/index.html>

The Atlas covers everything from physical characteristics and natural properties of the Great Lakes basin to laws and economic uses. It includes maps and charts and provides essential information about the region.

Background Information on Water Uses in the Great Lakes Basin

The Great Lakes Commission conducted a preliminary examination of water use data (1987–93) in the Great Lakes basin. The 1993 consumptive use in the Great Lakes basin is summarized on this *DEQ* website, as well as tentative projections into trends in water use and their impact on potential future water demands, developed by the International Joint Commission. Link:

http://michigan.gov/deq/0,1607,7-135-3313_3677_3704-12583--,00.html

Water Withdrawal Reports, Data and Graphics

This *DEQ* website highlights reports of water withdrawals made within the Great Lakes Basin by major water users. The *Compact* requires this information, which provides an environmental baseline for managing water resources in a more integrated manner and strengthens the legal basis for opposing unwarranted diversions of Great Lakes water to other regions of the country. The site includes a link to the *DEQ* Water Use Program, as well as withdrawal reports from 2004-2206, data from 1997-2006, and numerous graphics to illustrate withdrawals by various sectors. Link: http://www.michigan.gov/deq/0,1607,7-135-3313_3677_3704-72931--,00.html

The Recommended Criteria and Indicators of Groundwater Sustainability for the State of Michigan prepared by Alan Steinman, PhD on behalf of the Michigan Groundwater Conservation Advisory *Council* - GWCAC May 5, 2007 This paper summarizes the findings of the March 26, 2007 GWCAC Workshop and provides 6 major recommendations to the Michigan Legislature for the development of 11 groundwater sustainability indicators and 16 measurements with associated criteria to guide the sustainable management of groundwater resources in Michigan. *DEQ* website link here: http://www.michigan.gov/deq/0,1607,7-135-3313_41033-168788--,00.html

Ground-water-withdrawal component of the Michigan water-withdrawal Screening Tool By Howard W. Reeves, David A. Hamilton, Paul W. Seelbach, and A. Jeremiah Asher. This report describes the ground-water component of the *Screening Tool*, provides background information used to develop the *Screening Tool*, and documents how this component of the *Screening Tool* is implemented. Link from US Geological Survey (USGS) website: <http://pubs.usgs.gov/sir/2009/5003/>

Comments of Science Review Panel on the Michigan Water Assessment Tool

Panel Members: Hal Beecher, Joe DePinto, LeRoy Poff, Bill Woessner Trout Unlimited provides this background document from their website link: http://www.michigantu.org/images/pdf/SciencePanelReport_final_185835_7.pdf

It summarizes comments made about the development of the Assessment Tool to the Groundwater Conservation Advisory *Council* in December 2006.

ADDITIONAL RESOURCES:

Business Opportunities in Michigan's Water Sector

The Michigan Economic Development Corporation highlights water and water use opportunities in the state, including a link to relevant *DEQ* websites. Link: <http://www.michiganadvantage.org/Targeted-Initiatives/Water-Technology/Default.aspx>

Do You Need to Report Your Water Use?

This article summarizes what dairy producers should know about reporting water use and offers some tools for doing so effectively. It includes a link to a fact sheet for this sector and an Excel spreadsheet worksheet to help dairy producers determine how much water they use for watering cattle; clean-up of the milking equipment, bulk tank and parlor; milk-precooling and miscellaneous tasks. From MSUE; link here: <https://www.msu.edu/~mdr/vol14no1/curell.html>

Fifteen Things You Can Do to Make a Difference in Your Watershed

This is an EPA website that gives essential information and links to watershed management *planning*. This could be helpful for regions that form Water Use Assessment and Education Committees but do not already have a watershed management *plan* in place. Link:

<http://www.epa.gov/owow/adopt/earthday/index.html>

How to Conserve Water in Your Home and Yard

Fact Sheet done by MSU Institute of Water Research, with numerous links to other resources.

<http://www.gem.msu.edu/pubs/msue/wq16p1.html>

The Great Lakes Compact in Michigan

Tip of the Mitt Watershed *Council* website devoted to passage of the *Compact* and implementation in Michigan. The site also includes a Fact Sheet on the *Compact*. Link:

<http://www.watershedCouncil.org/protect/policy%20and%20advocacy/state-issues/state-issues/the-great-lakes-compact/>

Great Lakes Protection pages

The Sierra Club highlights why we prevented water diversions from the Great Lakes with the *Compact*, and gives tips on conservation here:

[http://michigan.sierraclub.org/issues/greatlakes/greatlakesprotection.html#Diversi
on](http://michigan.sierraclub.org/issues/greatlakes/greatlakesprotection.html#Diversi
on)